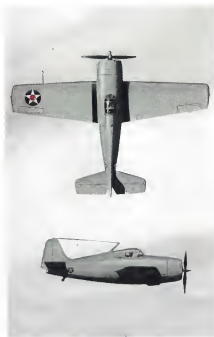


# AVIATION WEEK

APRIL 19, 1954

50 CENTS

A MCGRAW-HILL PUBLICATION



GRUMMAN WILDCAT



GRUMMAN COUGAR

## THEN AND NOW

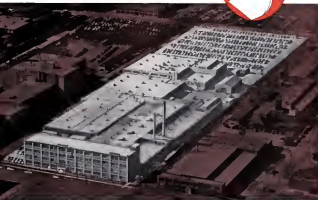


**THEN . . .** The Wildcat was small and tough and fast—and above all, ready when needed. After Pearl Harbor, Wildcats, the Navy standard fighter, struck back first.

**NOW . . .** Like the Wildcat, the Cougar is small and tough and fast. Like the Wildcat, the Cougar is ready when needed. They are the first swept-wing jet fighters in squadron operations with the Navy.

GRUMMAN AIRCRAFT ENGINEERING CORPORATION BETHPAGE • LONG ISLAND • NEW YORK  
DESIGNERS AND BUILDERS ALSO OF THE SIG-1 SUB-KILLER, THE ALBATROSS AMPHIBIAN, METAL BOATS, AND AEROBILT TRUCK BODIES

## Sundstrand announces new Aviation Division



SUNDSTRAND AVIATION has been set up as a separate division of Sundstrand Machine Tool Company. That new department's major programs may be Sundstrand's new goal of establishing adequate production capacity for Constant Speed Drives and other special-tailor accessories for the Air Force, the Bureau of Aeronautics, and engine and aircraft manufacturers.

The former Hydraulic Division of the parent company has been divided into two completely segregated divisions, the Aviation Division and the Industrial Division. The Aviation Division will op-

erate the entire 250,000 square-foot plant shown above, which has heretofore been shared with the Industrial Division. All products of the Industrial Division will be manufactured in a new plant now under construction.

SUNDSTRAND AVIATION is now in a better position to serve the aviation industry. In addition to its established production capacity for Constant Speed Drives, it has its own design, sales, engineering, and service facilities. Please feel free to call upon us whenever you need help in solving its or power generation problems.



Sundstrand Type "B" Drive — one of many drives available in the new plant now under construction.



Sundstrand Type "C" Drive — one of many drives available in the new plant now under construction.



Sundstrand Type "E" Drive — one of many drives available in the new plant now under construction.

# SUNDSTRAND AVIATION

Division of Sundstrand Machine Tool Company, ROCKFORD, ILLINOIS • Western District Office: Hawthorne, California

CONSTANT SPEED DRIVES • AIRCRAFT ACCESSORIES

RESEARCH BUREAU

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DEFLATED



INFLATED

## Prevents blowouts 8 miles above ground

PILOTS OF FAST FIGHTERS like the Northrop F-89B, shown speed to worry about their pressurized cockpits when flying at altitudes of 8 miles and up. The effect of high pressure on the inside and low pressure on the outside would often blow out the inflatable seal between cockpit and canopy.

B. F. Goodrich engineers went to work on the problem. They believed a really effective seal ought to adhere with low pressure and stretch very little or not at all. Low stretch would mean less wear, and the seal they developed has a U-shaped vinyl rubber base and a reinforced fabric diaphragm sealed inside

the base. (See diagram above). The diaphragm simply acts when inflated, works like blowing up a paper bag. Low pressure gives belt expansion with practically no stretch. Diaphragm stretching, like blowing up a toy balloon, is eliminated.

The new inflatable strip seal works almost instantly, even at normal 60°, a sealant with low pressure then softens and seals needed to meet temperature. There are other advantages. It resists wear and change better than ordinary seals. In its complex curves better fit seals and stretch faster. Sealing, wear and swelling are minimized.

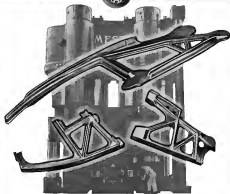
The new B. F. Goodrich inflatable seal is now in use on more than a dozen types of planes, including fighter jet fighters and bombers.

Other B. F. Goodrich products for aviation include: tires, wheels and brakes; De-icers; heated rubber; Fast-Seal Sealing Zippers; fuel cells, Arrears, Brakes, fuses, other accessories. The B. F. Goodrich Company, Akron, Ohio.

# B.F. Goodrich

FIRST IN RUNNER





**Greater Size and Speed in Aircraft**  
have created engineering problems, the solution of which has required longer and longer lengths of high-strength aluminum alloy. Examples shown above are forged structural members used in a modern military bomber; the largest more than seven feet over all. These are forged on an 18,000 ton press, the biggest ever built in this country.

**Wyman-Gordon Experience**—the most extensive in the industry—is keeping abreast of new forging demands involving the use of Beryl, Alumin, Magnesium, High Density Alloys and Titanium.

**Standard of the Industry for  
More than Seventy Years**

# WYMAN-GORDON

ENGINEERING IN ALUMINUM, MAGNESIUM, STEEL, TITANIUM  
WORCESTER, MASSACHUSETTS  
HARVEY, ILLINOIS DETROIT, MICHIGAN

## NEWS DIGEST



### Turboprop Convair YC-131C Nears Flight Status

Scheduled to make its first flight early next month, this new Convair YC-131C turboprop is also a P-1. Worth during a 1954 development engineering inspection. The turboprop is a Model 140 Convair-Lear powered by two Allison T38-A-5 turbo-

prop units at approximately 1,750 each. The YC-131C is the first U.S. military twin-engine turboprop transport. Convair modified a Model 140 in 1950 to take two Allison T31 turboprops for study by Allison Division of General Motors.

### Domestic

Trans World Airlines president Ralph S. Duncanson told Lockheed Aircraft Corp.'s management club last week that TWA is concerned about the DC-73's appreciable speed edge over the Super Constellation, challenged the plane builder to "do something about this problem." TWA flies Super Constellation, no DC-73.

supplied 311 utility and executive craft valued at \$2,695,080 during February, Aircraft Industries Association reports. The total compares with January shipments of 353 planes at \$2,995,000.

Charles N. Soren, president of Air Lines Pilot Association, was elected president of the International Federation of Air Line Pilots Association at the annual annual conference in Zurich, Switzerland. Capt. W. J. J. Montgomery of Canada was elected vice president.

Cecil C. Thompson, former executive secretary of the Airport Operation Council, has been appointed special consultant on airport subject to Civil Aeronautics Administration.

Gertrude Henry Hale, president of Babcock Aircraft Corp. during World War II and father of the company's present chief executive died April 3 in Peconic, Calif.

### Financial

Fairchild Helicopter Corp., Meriden, Conn., reports record sales of \$25,718,450 for 1953, 15% higher than 1952's \$22,418,814. Net earnings increased 48% to \$1,228,915. Backlog Dec. 31: \$10 million.

Republic Aviation Corp., Farming-

dale, N. Y., has declared a \$1 dividend on common stock, payable April 28 to holders of record April 9.

National Airlines has declared a regular quarterly dividend of 15 cents per share on common stock, payable July 15 to holders of record July 5.

### International

Crash investigations last week, pushed the midnight collection of an RCAF Harvard bomber and a Trans-Canada Air Lines North Star over Moose Jaw, Sask., April 5. The crash killed 37 persons, including TCA's safety record of more than three billion passenger-miles without accident. One of the victims was T.M. Reid, 50, Canadian aviation parent and veteran pilot.

Aeromexico de Mexico took delivery on its first two Convair 440s last week, flew the two-engine transports carrying from San Diego to Mexico City to get them into service as fast as possible. The airline was scheduled to accept delivery of two additional 440s later in the week.

Revised total of 145 jet aircraft were delivered to RCAF by Canada during March. The breakdown: 64 F4Es, 50s, 75 T-33 trainers and nine others.

## A user tells how AETCO SERVICE helped him



W. J. McWhorter, Jr.  
Director of Engineering  
General Electric Co.

Please accept our compliments on the report submitted covering your tests on our Transfer Barometer operating characteristics under various temperature conditions.

Aetco was selected because of your complete understanding of aircraft requirements and consequently the assurance that all tests conducted in your laboratory would be given their due consideration.

The Description of Tests and Test Results portion of the report in particular, was most commendable in that it describes in detail the methods and procedures used and the results of your observations obtained at points selected with discretion, thereby enabling our Project Engineers to completely evaluate the characteristics of the subject unit.

In view of the foregoing facts, Aetco will be given first consideration in all of our future requirements for this type of work.

**Aetco**

GENERAL AIRCRAFT  
COMPONENT TESTING  
including  
hydrostatic, pneumatic,  
static, shock, etc.  
AERO and mechanical  
test stand services, too

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EQUIPMENT  
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100-11-10000  
BALTIMORE, MD.

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April 19, 1954

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## New heart for servo systems



Aetco's magnetic reactor

The toroid, produced in our plant as part of a magnetic amplifier, was developed by our Control Engineering group. It is typical of the custom design work they do.

Designed for a light control system utilizing artificial "fuel," our magnetic amplifier depends neither on fragile vacuum tubes nor delicate relays. It is simple, and when fixed in a thermostating compound, impervious to shock. Also important, it is Airborne registered for Airborne-actuated control systems.

If you have a problem in the control system category, call us in. For information on Airborne Actuators, see our literature in the IAS Aeronautical Engineering Catalog.

**AIRBORNE**

Accessories Corporation

HELIX 2, NEW JERSEY

## New Jet and Turboprop Aircraft Fly Abroad



WINSTON (JET TESTS)—French are trying a Beechcraft S-10, 6020 Expeditor jet fighter (above) with small wingtip-mounted Turboprop engines fitted with afterburners.



SMOKE START—Dewar smoke from outside exhaust of Hawker Sea Hawk jet fighter adds over the deck of 16,500-ton HMS Eagle during recent maneuvers in the Mediterranean Sea.



JET COPTER ALONG—British Fairey Gyrodyne starts flight tests. Fairey engine drives compressor supplying air to jet-saver jets of rotor tips. Wing struts have jacking props.



BRITISH SUB HUNTER—Turboprop-powered Fairey Comet (below) leads low over the water with its rotor "fin" extended.



Chief Pilot Bacastow in the controls of a Douglas DC-8. This ship is one of a fleet of four operated by the F. G. Russell Company, world's largest manufacturer of non-ferrous metal castings and dies.

Ask the man with the  
most experience . . . ask

**C. F. Bacastow**

### 3 good reasons to FLY WITH GULF!



#### Gulf Aircraft Engine Oil, Selen-A

For added engine life, in where a detergent oil was not desired. Approved by Pratt and Whitney and other major engine manufacturers for all types of service. Resists sludge and carbon formation and retains its body at high operating temperatures.



#### Gulf Aviation Gasoline

It's "efficiency-plus," because Gulf Aviation Gasoline engine equipment is equipped with advanced electronic fuelers.

#### Gulftide Aviation Oil, Selen-B

For horizontally opposed and Ranger in-line engines. Minimum start and warm starting, all-temperature, all-weather, topping and plus fueling. Users of this good detergent oil have actually increased periods between engine overhauls by as much as 100%.



Gulf Oil Corporation  
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## WHO'S WHERE

### In the Front Office

**J. F. Schriener**, former assistant chief engineer at General's Sea Dogs Division, is now president and general manager of Consolidated Tool in Pasadena Co., Los Angeles, Calif.

**Edward J. O'Brien** has been elected vice president of Kansas Aircraft Corp., Bloomington, Conn. Other changes: Roger F. Clark, treasurer, Charles Kinsler, assistant secretary as well as assistant in general.

**Robert T. Finkle**, former president of New Britain Machine Co., has become chairman of the executive committee of the board. Also presented by the New Britain, Conn., are: Ralph S. Brown, president; John C. Jones, treasurer; and John C. Jones, treasurer; and John C. Jones, treasurer; and John C. Jones, treasurer.

**Harold Woodhead** has been appointed chairman of Agency Aviation Authority. George W. Kim, treasurer, and Dallas Taylor, James H. Wilson have been elected to the board of Board International Aircraft. New officers: New York: Richard A. Berman, president; R. L. Berman, F. J. Berman and Lloyd Berman, assistant secretaries.

### Changes

**Lois Davis** has joined Lockheed Hughes & Airplane Corp. as manager of public relations and advertising for the Engine Division of Farnsworth, N. Y. Dan Jensen, former public relations manager for the division, has resigned to go into personal communications work.

**Peter T. Corwin**, a new treasurer and controller for Public Airline.

**E. F. Hargis** has been promoted by United Air Lines to assistant to the vice president-national controller. Other changes: J. Donald Brown, manager of market and economic research; L. D. Swenson, vice president of economic forecasting.

**Edgar F. Shapiro** has been appointed controller for Fair Electric Corp., Fremont, Mich.; Charles A. Carlson is new personal manager.

**Robert F. Knox** has become research director for Westinghouse Electric Corp.'s Aviation Division, Division of Philadelphia. **Edward G. Seifert** has been named administrative assistant to the division manager.

**Walter J. Gierke** is new administrative manager of Lockheed Aircraft Service's New York base, succeeding William D. Hase, who has completed as chief. Gierke took over on date and returned to headquarters at Burbank, Calif.

### Honors & Elections

**Donald M. Meyer**, chief of Pacific Helicopter Corp.'s February Douglas Division, and R. M. Chalkley, the major helicopter development design engineers, received the Society of Automotive Engineers' Wright Brothers Award for 1951 at SAE's American Meeting dinner last week in New York.

## INDUSTRY OBSERVER

**Allison Division** of General Motors Corp. is delivering its T54 turboprop rated at 7,000 shp. The T54 was first power system rated to a single set of screws driving propellers. Aircraft scheduled to use the T54 include the Lockheed and General VTOL fighters and the Convair R3Y flying boat.

**Douglas B1 Supersonic** Division is about half-way through building the 10 A2D Skyhawk Navy attack planes left in the program after its seven earlier build last year. A2D was originally scheduled for large-scale production to replace the A4 Skyhawk in the standard carrier-based attack plane, but poor test and prop control problems with the T40 delayed development.

**Convair** now has a production order for a small quantity of TF-103 super-sonic delta wing trainers (Aviation Week Mar. 29, p. 11).

**Grumman** is building a lightweight fighter prototype for the Navy. Designated the F9F-9, the new fighter is radically different from any of the previous F9F series. It is scheduled to fly soon.

**Sikorsky** has delivered its third S-55 to Chgo. Helicopters, Ltd., of Vancouver which has leased the copter to the Canadian National Fisheries Department for use in Newfoundland to replace several patrol boats.

**USAF** is looking for a long-range all-weather fighter capable of intercepting enemy bombers close to the target, using a variety of weapons, including missiles of the way to the target. During World War II, bomber attacks of attacking bomber occurred after bombs were dropped. With atomic and hydrogen bomb-carrying aircraft, the defender's emphasis must be on cutting down bombers before they reach their target.

**North American F4D** (Weather Sabre) intercepter will have a total of 111 changes and modifications on each aircraft during the "operation pilot" program (Aviation Week Mar. 8, p. 11).

**Low, Inc.**, under a Convair contract, has conducted a drag-reduction program on a Convair 440 aimed at improving performance. The modified 440 is being flight tested by Convair at San Diego to evaluate the proposed Low changes.

**USAF** has selected an order for 36 Convair 440 aircraft modified as subsonic electronic test beds for the later Model 440. No change in price or delivery date is involved. Navy also has ordered a Convair 440 as a VIP transport and is negotiating for purchase of several more.

**Engineering department** of American Machine and Foundry Co. has developed a series of tests for turboprop engines and is trying to convert USAF to further development.

**Boeing** finally has shaped officially the exterior of the 16-mr. A6A aircraft carrier to be used as a standard reference for the latest crop of RAF fighters, including the Hunter, Swift and Ghost fighters. The A6A has a crew of 1,280 men on board, but a relatively low weight-to-carrying capacity.

**Douglas B1 Supersonic** Division has completed the first production model F4D fighter for Navy.

**Design studies** by Douglas Aircraft Co.'s helicopter group have indicated that turboprop engines located at rotor tips have considerable promise for the future. However, rotor tip turboprops have not passed beyond the design study stage.

**North American Aviation's** \$10-million atomic power plant scheduled to be built for the Atomic Energy Commission (Aviation Week Apr. 3, p. 13) will be located in the Santa Monica Mountains near the NAA test facility. The 20,000-hp. plant is scheduled for completion in 1958. AEC will spend \$7.5 million on the project, with NAA contributing \$2.5 million.

## Indo-China

Watch for continuing trend of increasing U. S. military involvement in Indo-China war. Evidence: Japanese aircraft is bombing in southeast Asia. Chinese Communist air force is re-deploying from Manchuria to bases on mainland opposite Vietnam and along Indo-China border. Air strikes by Communists against safety flights in Indo-China probably would provide rotatingly by members of U. S. Search Fleet and land-based USAP planes in the Philippines.

## Airlift Shift

They are well advanced toward a stable trans-Pacific airlift to Indo-China. Military transporters already are being shifted from Korea operations to the U. S. military supplies to French in Indo-China, and from Pacific coastal and central operations to the Vietnam. Eastern Airways and Western National Airways now are completing part of the Korea contract airlift, but Indo-China route probably will see larger role for non-scheduled C-14 operations in the Pacific.

## Burke Airport Issue

Militarists and civil aviation officials still are wrangling over possible conversion use of Andrew Field at Atlantic for Washington National Airport, but CAA Administrator Fred H. Lee says that the new Burke Airport is not yet a dead issue. Because CAA has \$549,000 investment in 1,000 acres of land at Burke.

## ACC in High Gear

An Coordinating Committee's drive to meet the May 1 deadline for submission of its air policy report to the President (Aviation Week Apr. 5, p. 11) is in high gear. Drafts of papers on all but 11 of the approximately 40 subjects under review are being circulated to industry organizations.

Papers not yet submitted along for submission to industry include such topics: collaborative airports as satellites, routes, mail, and use of domestic and international air transportation system.

## Tolbert's Advisers

Covers Louie and Charles A. Lindbergh are serving as top-level technical advisers to USAF Secretary Harold Tolbert on technical matters.

## Radar Network

Rebates of Defense Secretary White's endorsement that a new and secret radar warning radar network was being built jointly by the U. S. and Canada hardly had been before last Canadian newspapers noted that two items of right of the secret radar and radar had been provided by the Royal Canadian Air Force.

Personal transfer to the base was announced by the Remond, official NCAP publication, an unclassified magazine distributed publicly.

## More AEDC Money?

Washington observers are speculating on whether

USAF will roll in a special supplemental appropriation to continue construction work at the Arnold Engineering Development Center at Dayton, Tenn. No AEDC money was contained in the military package bill recently submitted to Congress.

## SAS Decision

Decision is expected soon from State Department and Civil Aeronautics Board on the request by Southeast Asian Airlines Station (Aviation Week Mar. 28, p. 59) for use at Los Angeles as the West Coast terminal on SAS's proposed transpacific route between the U. S. West Coast and Southeast Asia.

## Airport Funds

Although the Administration is prioritizing an airport development, it is being seriously laced on funds for highways and other public works. For fiscal 1995, the Administration is asking \$167 million for road building—\$56 million more than it requested this fiscal year. The Administration also is recommending that 1975 dollars—an increase of more than \$168 million—be authorized for fiscal 1995.

After being funds for new airport developments cut off completely this fiscal year, aviation interests are happy over the \$15 million Undersecretary of Commerce for Transportation Robert Murray says will be requested for fiscal 1995. They think that much more than this would make be justified, however. Airport development is lagging behind the schedule set by Congress.

The 1994 Airport Act provides \$100 million in federal funds over a 10-year period. With the \$15 million to be proposed for fiscal 1995, only \$207 million, or less than half of the total \$100 million, will have been appropriated over a nine-year period.

## Hydrogen Bomb Angles

Representatives of the second series of hydrogen bomb blast are being held in the Pentagon where they also gave questions on future development of the three series. Increased vulnerability of Nevada test facilities to both land-based attacks and hydrogen bomb effects by enemy land-based weapons will be the sharp debate over the future of the test force. Also, said and written of the present "defensible" hydrogen bomb use too much to consider merely, leaving USAF with a virtual monopoly in the field for the immediate future.

## Airpower Debate

Watch for the debate on the future of U. S. airpower to continue in the Senate with the Staff Sergeant's leading Democratic attacks on Republican cuts in the airpower budget. Senator's needs knowledge of Pentagon procedures suggests the battle be lost at the opposition and a concrete drop occurs among Republicans in an Capitol Hill and in the Pentagon.

## USAF Recruiting

Eng. Gen. Arno H. Lockman, deputy director of USAF Information Services, is scheduled to command the new Air Force recruiting operation at Wright-Patterson AFB. The Recruiting Command will operate under the jurisdiction of the Air Training Command.

By Katherine Johnson

Key members are looking at the Administration's economic program for civil aviation.

But are two major developments: ■ **Support by Undersecretary of Commerce for Transportation Robert Murray** says that the department he governs has given his quietest disavowal in deciding where to put money should go to make some money around the air. ■ **Rep. McCormack**, co-author of the 1994 Airport Development Act.

McCormack said at a session of the Senate Appropriations Subcommittee on Commerce that Murray was saying to leave a "yes" and continued low for chopping off support funds for a year.

■ **Senate Interstate and Foreign Commerce Committee** unanimously approved a resolution during the Administration to prohibit the use of funds to have the airport industry finance the operations of Civil Aviation Station and Civil Aeronautics Administration through a system of fees and charges.

A provision tucked into the fiscal 1994 Independent Office Appropriations Act declared federal agencies "shall be self-financing to the fullest extent possible" and directed the development of a program looking toward this objective. With this provision as a basis, the Budget House directed CAA, CAA and other agencies to submit programs for financing their operations by May 1.

The Senate resolution does not have the force of law. This raises the question as to whether the Administration will move ahead with the amendment program.

■ **Fees and Charges—Opening a quick** drive into program of fees and charges, Senate Interstate Commerce's chairman John Chafee explained. "The committee is not looking to the idea of assessing fees and charges. In fact, I think it leaves it almost exclusively."

"Let the members see if the committee can agree that such a proposal meets basic questions with regard to the

fundamental philosophy of regulation. That first, that the Congress should set up least and then industry agrees to follow in imposing charges for a system."

The Budget House directive sets up, assessment standards. The Senate Interstate Commerce Committee plans to consider legislation in the near future setting up other, and probably more limited, standards.

■ **Ad Threatened—The Administration** Senate fight threatens the \$15-million airport and program planned for fiscal 1995. Present law allows CAA to spend 25% of airport funds at its discretion, the remaining 75% to be appropriated several times during the year. A law made based on act and population.

It appears certain the Senate will wage a showdown fight against increasing the discretionary fund to 10% in the coming year by Murray. Question is whether Murray will support the \$15-million program without being granted more money to use the authority should go.

■ **Ships Collisions—At the subject**, Murray remarked that Murray's decision to go ahead with an airport program after a year's postponement was "lawful," but he turned to sharp criticism of the Administration's approach to the two policy changes in the program.

■ **The basic standards of determining** eligibility of specific airports should be submitted by the Department of Transportation to the Department of Commerce for the contract, McCormack warned. "If you fall into the same category as Congress, I am sure you will get into the same category with Mr. Murray, which isn't an enviable position at this time."

The committee requested complete data on the management contract, including information as to whether there are any personnel ties between the firm and Congress.

The subcommittee also requested a report on Commerce Department participation in CAA activities. "To say

civil federal grants too small to accomplish much. 15 states received appropriations of less than \$100,000, and 39 states less than \$4,000.

With the 1995 discretionary fund, McCormack told Murray. "You will have a lot of fun. That means your department would take over control of where reports would be placed. You would be the one that—I suppose you would like to see that."

Murray replied: "I have very little to do with where we put funds for airports."

The increase in the discretionary fund was not recommended by the Transportation Council, which is Commerce Department on the airport program.

Murray added that there was "wide discussion" as to whether it was desirable to continue the individual program at all. General opinion in the aviation industry is that Murray is opposed to the program, but denied to do with it in view of the recommendation of the Transportation Council.

■ **Reimbursements—Sen. Styles** Budget chairman of the full committee and the Commerce Committee, expressed skepticism of the management program being run for Commerce Department by Group, McCormack, and Page.

"We are interested in issues that will provide officials and not set up a dead system that will result in charges that will change hands," Styles said.

"I agree with you," McCormack interjected. "But this management program is a complete waste of funds."

McCormack and Congress did an appropriate funds for the program. When Assistant Secretary of Commerce Linda Westley and the Department felt free to use its general merchandise money for the contract, McCormack warned. "If you fall into the same category as Congress, I am sure you will get into the same category with Mr. Murray, which isn't an enviable position at this time."

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timberline equipment to the West and Air Force on time.

Contract Completion—"Of course it may be assumed that the contractors are in a state of panic," says "The Air Force is not in a hurry to make a profit in order that they may live. As a matter of fact I want him to make money and to make a profit."

But there must be a consideration as to how the Air Force is to be able to pay for the services of the contractors. It is not sufficient that he make a contract or agreement without having full responsibility for carrying out every minute part of his contract and making the government pay for the services and that he complete the contract exactly on time.

The business and the partnership, the profit sharing, the contractor, to make a profit, should never be the most important factor in the consideration. It is an important factor but it cannot be the most important one. I feel that the Air Force will come and will come in simple questions if the requirements of the contractors including timely delivery are not completed with in every respect."

## USAF, Navy Obligate \$536 Million for Air

Air Force and Navy obligated \$536 million for aircraft and related procurement during the first eight months of fiscal 1959 out of a total \$5.3 billion available during the year.

The two services indicated the results after submitting disallowances (resulting from contract cancellations, more rapid orders as to what occurred in "obligation" and other factors) from the gross obligation details.

Air Force obligated only \$164 million out of total availability of \$5.1 billion during the July-December period. USAF's net obligation for February was only \$20 million.

Navy obligated \$572 million during the July-December period out of a total availability of \$1.3 billion. Navy obligated \$31 million more than was obligated during February.

By March, neither USAF nor Navy had spent as yet as much as 1954 appropriations. Both services still had unused contract funds from previous years.

With \$6.6 billion in unobligated funds on hand May 3, USAF still had \$2.3 billion to obligate before starting to use the \$5.5 billion appropriated for fiscal 1959.

The unobligated balance on hand May 1: \$25.3 billion—\$18.1 billion for USAF and \$7.4 billion for Navy.

## Aircraft May Lose Titanium Flow

Plane and engine builders hold back on using scarce metal, causing producers to seek other markets.

Scarcity of titanium may be diverted from the aircraft industry into other fields. This was developed at hearings before the Senate's Subcommittee on Strategic Materials and Minerals, headed by Sen. George Malone.

Although engine and engine manufacturers have testified that the industry in fact could utilize up to 500,000 tons of titanium a year, a shortage is being built up out of current production of only 5,000 tons a year. By the end of 1954, on the basis of current contract orders, an inventory of 3,000 tons is expected.

The Strategic Materials Committee, by vote of the majority of titanium and producers of the supply, is holding back on including the metal in production plans.

Meanwhile, producers are becoming impatient to seek other markets.

The issue of the production of titanium is whether to permit the output of government-owned facilities to be available to a sufficient extent to meet supplies to the aircraft industry, which has the first priority for the metal, or to let it go to other manufacturers and keep titanium supply and demand on a hand-to-mouth basis.

Dr. Albert Einstein, Director, Materials Research, has testified that the results of the shortage of titanium in the aircraft industry would be disastrous. "Although it would delay the time when aircraft production could use titanium, it would strengthen the military base. Clearly that is one factor we should take into consideration from the security point of view."

Malone and the Strategic Materials

Committee have been very busy over the past year.

An industry advisory committee at Commerce Department's Business Defense Service Administration has recommended that 10% to 25% of titanium output be allocated to civilian markets.

President Ben-Gurion Wright Corp. has been told by the industry to hold back on using titanium. The firm has been told to hold back on using titanium in its production of titanium in CW engines, which would utilize half of the titanium output over the next few years.

"If one other engine firm did the same, we would use the whole supply," he pointed out to the committee.

Under the plan, CW would use 200 tons a month, or 2,400 tons in the 367 engine in 1955. When the 187 tons would be used, the firm would still have 100 tons a month—more than 3,600 tons a year.

Production of the U-2's are presently estimated that every piece we produce, plus many more, can be made of titanium—of what we get."

He observed that "we do not dare put titanium in engines unless we put it in a safe, because if we were to put it in a safe, and then suddenly find that to take it out of the engine, the engine would not perform well."

Planning concerned with the fact that "the thing is to do it to get it into the aircraft industry."

Temporary Supplies—There was great agreement at the Senate hearing that the supply in titanium is "too poor" to allow the metal to be used for the military.

Reports that too much titanium is being produced, planning declined, "are completely and utterly unrealistic."

Office of Defense Mobilization and General Services Administration reported in steps being taken to increase production.

Dr. Robert Kellips, professor of metallurgy at Columbia University and chairman of GDS's Titanium Advisory Committee, testified that the results of titanium shortages (American West Dec. 7, 1953, p. 18, Nov. 23, 1953, p. 22) that the requirement for titanium in a few years will be substantially greater than the production which is programmed to reach \$3.3 billion a year by 1956.

"It wouldn't surprise me to see the titanium shortage arise in the order of magnitude of 150,000 tons a year in five or six years," he said.

Negotiations—General Services Administration Edward M. Brown reported that several negotiations about titanium production are underway with:

- E. I. du Pont de Nemours Co., for 5,000 tons a year additional production (American West Feb. 3, p. 17).
- Electro-Nebraska, a subsidiary of Clow-Cable and Cable Corp., for 10,000 tons a year capacity.

- Dow Chemical Co., for 1,700 to 1,800 tons a year capacity.

- Houston, Tex., with a contract now in the drafting stage.
- Monsanto Chemical Co. has been asked to submit a proposal involving a new process it has developed in cooperation with National Research Corp. and also a proposal for a 5,000 ton-a-year Kroll process reduction plant.

- Automobile Co. contract negotiations are to start soon.
- Western Process Co. Production has been reported by Defense Department to submit a plant under an experiment for experimental titanium work.

In addition, Messer reported, discussions looking to further increase titanium capacity are underway with: American Copper Co., Wheelabrator Chemical Co., Chicago Development Co., Kaiser Aluminum and Chemical Co., Eagle-Prater Co., Columbia Southern Chemical Co., The Chloride Co., National Industrial Products Corp., New Jersey Zinc Co., United International Research, Inc.

Production—Mr. Gen. Kern D. Meyer, chief of Air Material Command's Procurement Division, stated that the Air Force is looking to increase production of titanium into aircraft and engines.

- Quality of raw material being produced is not uniform and the quality of alloys is not uniform.
- Quantity of raw material being produced is not uniform.

"The quality of raw material being produced is not uniform and the quality of alloys is not uniform," he said. "The raw quality of the metal will be better and will be better than I can see."

There is a shortage of processing and finishing facilities. "The aircraft industry is concerned with having less to do at," Meyer said, noting that the industry involved in manufacturing new titanium parts, is not manufacturing and only.

- The limited supply. "We cannot produce titanium to be converted into alloys to be used in aircraft," he said. "We are assured that supply will be used."

- The high cost. However, Meyer said that because of the alloying process of titanium, which is a very expensive process, it is not in competition with military planes.

Capitalization of Surviving Corporation In Convair-General Dynamics Merger		
Preferred stock \$2 convertible to 100 convertible \$50 per share		
Common stock and preferred		157,343 shares
Common stock value \$1		
Authorized	6,000,000 shares	
Outstanding and held paid	1,875,343 shares	
Outstanding and held paid under stock purchase plan	175 shares	
Reserves		
For conversion of preferred stock	165,315 shares	
For conversion of common stock	197,146 shares	
Retained stock option for purchase of common stock authorized with option to 10% of outstanding common stock	197,316 shares	

## Convair Makeup Under Dynamics

Shareholders of Consolidated Vulcan Aircraft Corp. and General Dynamics Corp. are expected to approve next week (Apr. 24) the merger of the two firms (American West Mar. 3, p. 16) when they vote at a special meeting in Denver, Colo.

Under terms submitted to the Securities and Exchange Commission, Convair will become a division of Dynamics without changing management or structure.

Control. Although General Dynamics received stock control of Convair May 15, 1953, when it purchased a controlling block of 404,000 common stock shares (American West Apr. 6, 1953, p. 11) from Fred B. Odell's Atlas Aircraft Corp., it had not until March 1947. The block represents about 17% of the aircraft builder's 2,379,395 outstanding common shares.

The merger makes Convair the fourth subsidiary of General Dynamics.

- Convair's parent company is General Aircraft Corp. May 29, 1933, merged with Vulcan Aircraft, Inc. May 18, 1943, bought of Odell and was merged with Atlas Aircraft, Inc. May 18, 1947. The block represents about 17% of the aircraft builder's 2,379,395 outstanding common shares.

- General Dynamics Division, Syracuse, N. Y., original firm of the group, builder of electronic units and gunnery for aircraft and industrial use.

- General Dynamics Division, Dayton, Ohio, a subsidiary manufacturer currently building the atomic-powered Sea Wolf after completing the Nautilus and engaged in Atomic Energy Commission work.

- In 1953, Convair settled \$10,256,000. Its holdings of orders Nov. 30, 1953, was \$1 billion, 92% of which was in government orders. Dynamics settled \$6,124,909 and had a \$251 million backlog of orders, which is a very good record in the U. S. and Canada.

- Unannounced Dynamics—The merger is an outgrowth of a study begun in the latter part of 1953, when each company failed to obtain a sufficient number of directors to make the purchase of such a move. Convair's executive retained by the firm, and Dynamics' retained by the firm, to determine if a merger would be feasible and desirable from a financial standpoint.

The two companies jointly retained Stockman & Porter, an independent engineering firm, to make acquisition, production and operations of both companies. All stock ownership for the merger and both boards of directors approved the move in February.

- Scipio Conference—General stock of the merged firm will have a per value of \$1. Each share of Convair common stock, with a per value of \$1, will be converted into five shares of a share of Dynamics common. Each of the 600,000 shares of shares of Convair held by the parent company will be converted into 1,200 shares of Dynamics common.

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## Navy Trainer

Navy is taking new cost proposals, including open parts, from North American Corp. and United Aircraft Corp. in the trainer design competition.

The decision, in effect, requires the competition. However, Ryan Aeronautical Co., which had ordered a Model 72 trainer, will not participate in the new proposal.

Decision of the Navy in preparing new specifications for the North American and Ryan's B-26 with several other modifications. Principal change is a larger tail fin in both models.

New trainer will replace the North American B-26.

chairman of Convair, chairman and president of Dynamics, and managing director of Convair, will continue as chief executive of the parent firm.

Hopkins will be a member of the executive committee, along with:

George W. Goddington, Dynamics director since 1953, Otto Marx, chairman of the executive committee and a director since 1953, Joseph T. McNamara,

Convair president and a director since 1952, Clifford M. Miller, director of Dynamics since 1949, J. W. Nantz, executive vice president of Convair and a director since 1953, and Frank Pace, Jr., former director of the Budget Bureau and Army Secretary, now executive vice president of Dynamics and vice chairman of the boards of both Convair and Convair.

► **Innovative Plan**—Along with the executive, Convair has drafted a new incentive compensation plan for its employees along the same lines as that used by General Dynamics. It would be retroactive to Nov. 10, 1953.

No profit sharing will be made under the plan until after 6 1/2 years have elapsed upon capital after taxes. The plan provides for distribution in each year of a maximum of 5% of the profits before taxes after deducting an amount after taxes equal to 6 1/2% return on capital employed.

► **Solemn-Aggregate** salaries paid Dynamics officials during 1953:

Hopkins, \$223,746; J. Godfrey Nantz, senior vice president and president of Convair, \$55,100; Lawrence B. Richardson, senior vice president and vice chairman of the board, \$46,528; G. Ramsey Robinson, Jr., senior vice president, \$51,292; Pace, \$36,646.

In addition to the above salaries, the officers received as Convair directors since 1953: Hopkins, \$1,474; Nantz, \$5,214; Richardson, \$4,974; Robinson, \$5,214; and Pace, \$5,734.

## AF Goal Is Quality, Lewis Tells SAE

U. S. Air Force has reached its desired numerical strength and now is concentrating on quality and readiness, Assistant AF Secretary Roger Lewis told the Society of Automotive Engineers National Assembly Meeting in New York last week.

He said the shift the aircraft industry's emphasis to reliability, quality and deliveries "at the right time and in the right quantity."

► **Tool Expansion**—Ray T. Harley, chairman and president of Carlin-Wright Corp. and promoter of the SAE Automatic Production Forum, emphasized the need for government cooperation in tool expansion programs necessary to keep abreast of aircraft design progress and to meet emergency.

He said developing standard machine tools of World War II vintage is a mistake. These should be jacked, he noted, and new ones brought to replace them, with allowance permitted for accelerated depreciation at a rapid period of the tool within five years.

► **Up-to-Date Shop** — Carlin-Wright should be spending about \$10 million per year on new machine tools, he reported, and would do so if tax legislation were passed effectively liberating expenditures.

Harley maintained that a plant should be equipped with modern equipment, operated on a 40-hr., single-shift basis and be able to switch over to a three-shift, six-day operation without any considerable reorganization as a result of its up-to-date machine stock.



## Latest Views of Lockheed VTO Fighter

New pictures of Navy's Lockheed XP-70 reveal that fighter show the unusual plane on speed, horizontal tail fin leading gear (top photo). Raised tail in the VTO

out and to maneuver XP-70 into vertical stance. Other photo details the XP-70's undelay and shows the scoop-chest outlet opening (just ahead of tail).

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Remote Read Telemeter. Model 100-1

These packages each incorporate two dials in either 10 or 100 scale units with a 100 scale unit and 10 scale unit. Both are designed to be used in the laboratory and field. Both packages include an 800 cycle per second oscillator and a 100 cycle per second oscillator. The package may be used in either 10 or 100 scale units. Each package includes a remote meter of 100 scale unit and a remote meter of 10 scale unit. The package may be used in either 10 or 100 scale units. The package may be used in either 10 or 100 scale units. The package may be used in either 10 or 100 scale units.



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## Copter Line Wins High Mail Rate

But Board voices concern over NYA's subsidy need, plans periodic review; Pioneer also gets final pay.

By Frank Shea, Jr.

Civil Aeronautics Board, continuing to push settlement of outstanding mail pay cases, has established final rates for two more airlines.

• **New York Airways**—For transportation of mail over its entire system from Oct. 15, 1951, through Dec. 31, 1953, will receive \$1.35 an ounce, equivalent of \$1.58 per average plane-ounce flown in scheduled service.

• **Pioneer Airlines**—For continued transportation of mail over its system from Oct. 15, 1951, will receive an effective rate per designated route flown at 45 cents multiplied by the rate of scheduled mail rates operated during each month (not in excess of 9,000 mi. flown the number of days in the month) to the designated route flown. Pioneer is scheduled to merge with Continental Air Lines (AVIATION WEEK Mar. 5, p. 7).

• **High Schedule**—In setting the rate for NYA, last scheduled helicopter airline in the U. S., CAB members concern over the high subsidy requirement, noting that it far exceeds original estimates. For this reason, a periodic re-evaluation of the helicopter experiment is planned by the Board so "future subsidy requirements in cases of benefits derived." The will re-evaluate the operation of Helicopter Air Service of Chicago and Los Angeles Airways, as well as NYA.

Despite NYA's high subsidy requirement, CAB says the carrier has no plans to drop its rate for its weekly of com-

munication in view of the highly diversified character of helicopter operations.

NYA's temporary two-year certificate authorizes passenger, cargo and mail service over the following routes:

• **Airport route**, from La Guardia to Newark and Elizabeth Airports and a point in mid-Manhattan.

• **Northern route**, between La Guardia Airport and Bridgeport, Conn., via various intermediate points in Westchester and lower Connecticut.

• **Southern route**, from Newark Airport to Princeton and Ashbury Park, N. J., via intermediate points.

• **Eastern route**, between La Guardia Airport and Haverhill, N. Y., via intermediate points.

• **Western route**, between Newark Airport and Paterson and Morristown, N. J., via intermediate points.

All persons, passenger operations are limited to service between the three New York airports. Mail and cargo service is as of the southern and northern routes as well as between the three airports.

Service over the eastern and western routes has not yet been inaugurated, and has the carrier introduced operations directly into Manhattan. Chief difficulty with regard to Manhattan service has been location of a suitable helicopter landing site adjacent to the business district with an over-water landing.

(AVIATION WEEK Sept. 24, 1953, p. 115).

• **Copter Record**—Using five Sikorsky

HO-4S, NYA transported 42,716 pounds of mail and 4,121 pounds of passengers and baggage in an average load factor of 28.2% during the subsidy or view period.

Average flight attendance during this period was equivalent to 3.75 per day. Although this figure is substantially below levels obtained by operators of fixed-wing aircraft, CAB holds that it is not unreasonably low for the type operation performed by the New York helicopter line.

The Board says the airline's route structure entails extremely shortened operations, by fixed-wing aircraft, and the schedule pattern has to a large part been free to accommodate the needs of the postal service, thus calls for reduced service on weekends and holidays.

• **Pioneer Rate**—In a close order of establishing Pioneer's subsidy rate, CAB stipulates that as an aircraft shall the amount of mail pay computed be less than:

• **Amount** obtained by multiplying the average rate established for transportation of mail by the number of weeks mail carried during the month.

• **Amount** obtained by multiplying the average rate established for transportation of mail by the number of weeks mail carried during the month.

All formulas are to be computed on the basis of direct airport to airport mileage between points served by said service, CAB says.

• **Indefinite Rate**—The Pioneer proposal was estimated based on the Board on Oct. 12, 1951, when the airline had a period of testing that the agency established final mail rate on longer-term basis.

Pioneer said its mail pay requirements had increased because of increased operating expenses and a reduction in commercial revenues. The airline had forecast that it would schedule 3,600,710 mi. over its system during 1954 at a performance factor of 99.0% versus 3,652,513.

The Board holds, however, that based on Pioneer's operating experience from October through January and current schedules on BAC, it appears that the carrier will schedule only 3,197,117 mi. in 1954 at a performance factor of 99.0% resulting in operations of 3,491,946 plane-ounces.

At this reduced volume of mileage, says CAB, it is reasonable to anticipate, in light of Pioneer's forecast and actual data, a load factor of 48.30% during 1954, equivalent to 10.14 passengers per mile.

With the adjusted schedule pattern and the Board in view, the Board concludes that all of the airline's per postal mileage is required as the rate.

## South Koreans Get Aero Commanders

Three basic two-engine Aero Commanders, leaving South Korea six days today, shortly were flown from Aero Design & Engineering Co.'s plant at Chikilong, Okla., via the trans-Pacific North Atlantic route to Korea by Fleetway, Inc., a leasing organization. The South Koreans will use the planes for transportation of government officials as well as military leaders. The two-engineers are the first two-engine planes to leave South Korea on their own, a government official reports.







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808 realized in the sale of DC-3s to Air Force.

Naturally, such profit would mean a "very recent," which would have been utilized to reduce the subsidy in the final rate. Because the nation's 2-6-2 operation was ground and continued operation of DC-3s assured, the Board held that such profit was not properly available as "other revenue" in reduction of the carrier's cost.

The carrier has since sold its 2-6-2s, and now operates DC-3s exclusively.

## Republic Sales Drop; Fairchild Sets Record

Republic Aviation Corp.'s sales during 1953 dropped slightly to \$411,850,845, compared with \$412,335,088 the previous year, the firm's annual report reveals.

Net income, however, increased to \$5,114,181 from 1952's \$5,896,001. It declined in last year's income was \$789,000, estimated to be due Republic when negotiations on F-84 Thunderjet contracts are completed.

Record Earnings—Fairchild Engine & Aircraft Corp. reports last year's sales and earnings were the highest in its history.

Sales increased to \$178,135,266, compared with the previous year's high of \$141,645,763. Net earnings also topped from declined to \$4,815,541 from \$3,340,621 in 1952.

Sales and backlog of other major divisions from were projected in Aviation Week, Apr. 12, p. 21.

22,000 Planned the start of 1954, Republic Aviation was moving delivery of the 22,000th plane built by the company since its inception, including 17,129 P-47 Thunderbolt piston-engine fighters and 4,873 F-84 Thunderjets, but of which was delivered July 29, 1953. The last F-84 went to the Turkish Air Force.

Republic's Guided Missile Division last year was handling preliminary design, systems feasibility and operations analysis under military contracts, the company says, and its missile facilities are to be expanded this year.

Volume Production—Fairchild's Aircraft Division last year shared volume production of outer wing pinch and vertical fin for the Boeing B-52A Stratofortress eightjet bomber and is continuing experimental work with the Fairchild XC-120 Pochigine.

Output of C-119s will continue at reduced levels through 1954 and 1955, and the Chaco-Graded C-119s is to be turned out on scaled assembly lines.

The Engine Division has received a prime production contract from the Atomic Energy Commission for equipment to go to AEC's processing facilities. Reduced output of components

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FIGURE 4. *Typical*  $\alpha$ -cell mass (area) versus age (years) in the *ob/ob* mouse.  $\alpha$ -cell mass decreases with age in the *ob/ob* mouse.  $\alpha$ -cell mass was measured in the islets of 10 *ob/ob* mice at each age. The mean  $\pm$  SEM is shown. \* $P < 0.05$  versus age 12 weeks.

REYERSEK SCHEMES were last publ. finalized and were 1973.

### Boeing Studies Reveal that . . .

## Jet Thrust Reverser Is Safe, Practical

Device does not change turbojet operating characteristics and minimizes effects of uncontrolled reversals. SAE hears.

First details from an American manufacturer on the feasibility of reverse thrust for landing in the landing deceleration of jet transports have been revealed by a Boeing Airplane Co. engineer.

<sup>a</sup>These details indicate

\*A practical jet-reverber installation can be available in the near future to give jet-type planes the operational flexibility of present-day reversible propeller-equipped aircraft. It will probably be a chamberlain nose.

- Petrosven is adaptable to a wide variety of engine installations, will not do gross excess fuel economy

• An inherently safe and reliable installation results from operation of the reverse thrust system from the forward thrust system. With this operation, consequences of reverse failure are considerably less severe than comparable failure of nozzle-type poppetes. Even the most critical type of jet reverse failure will result in conditions only slightly more severe than a simple engine failure.

- A small increase in weight will be necessary to obtain the operational flexibility available from design thrust.

► **Fuselage and Jets**—These are the opinions of Boeing Airplane Co.'s Joseph Sutter. He analyzed and compared various thrust requirements for jet and piston transports during a discussion of design work and testing of jet engines before the recent National Acad-

nautic Meeting of the Society of Automotive Engineers in New York.

Top Secret officials have told *Astronomer* Wenz (Mar. 29, p. 22) that production versions of their new jet transport, the 787, will be equipped with thrust reversers.

Fortunately, Boeing's B-51 and B-47 bombers will also get the devices.

Satter parents not that far the ones.

on-day station toward transport loading on a mainline freight, dry, concrete runway, an adequate margin in stopping distance exists using brakes only. On an icy runway, a large part of this margin is used up. Application of reverse thrust after landing on an icy runway, plus use of brakes, gives a margin in stopping distance which is more than equal to that achieved on



BLAST SHADOWGRAPH reveals how turbine engine is deflected by jet stream

Early complex design studies show that a well-balanced jet transport will be able to land and stay on the same distance as contemporary transports on a dry runway, better tops. But any time you get transport, since it will be required to operate during all types of weather and runway conditions, she will have to incorporate additional stopping devices, so does the pilot-powered constraint.

► **Drug Charts**—Of several methods developed to improve shopping capabilities of patients without prescriptions, Sutter claims that one of the most noteworthy is the drug chart.

Though quite successful in cutting operations, this device has limitations which cut operational flexibility. One of these limitations is that outside facilities are required to handle a crane once it is deployed. Another drawback is that the crane must be deployed quite close to touchdown to be fully effective, since the drag effect is a function of speed.

The chain becomes less effective near the low-speed end of the ground roll, which may be the point at which maximum braking is needed, Sathu claims.

Study of various stopping methods brought the conclusion that systems that would have to be developed for jet engines if jet transports were to have the operational flexibility of present-day transport.

• Designing Anna-Bourgeois program to develop a jet streamer design with the establishment of a set of design objectives. Most important of these are:

• **Safety and reliability.** These characteristics are to be attained through basic design and simple structural features. Use of electronic controls and intricate protection devices is avoided.

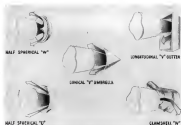
• **Operational flexibility** comparable to present transport equipment. This would be achieved if, on an emergency, the plane could be stopped with brakes and reverse thrust in the case

distance it could be stopped with brakes alone on a dry runway. Analysis indicates reverse thrust of about 40% of maximum forward thrust is required to meet this objective, Saitter reveals.

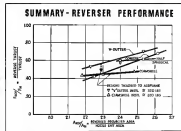
• The baggage claim was somewhat odd. In some cases the bags glide past unnoticed and a jet transport can be quite interesting. In-flight system operation is ruled out. This means the sampled device passes. But not.

- Engine economy should not be affected by the reverser when the latter is not in operation. Another requirement is that the reverser should not adversely affect engine life or engine control characteristics when in operation.

Requirements of safety, reliability and independence of the various law



REVERSE CONFIGURATIONS Below used. Cleaved: cleaved next group



REVERSE CONFIGURATIONS Raring trial. Clonidine showed most potent.

the basic engine indicated that the device would have to be completely out of the pci slot during normal on-line operation.

• Shapes and Types—Many shapes of greenways were tested in Fleming's seventh test facility, some as early as 1951. Some of the reverser configurations tested are illustrated above. The tests of these configurations showed that about 45 to 50% reversal of the payload is possible with units that could reversibly fit into the space available near the crane rollers.

As design and testing progressed, the chamber type of process shared the greatest promise from a standpoint of meeting the design objectives, reducing

col amplification, inverted weight, and an above-below-average factor.

► **Mondy Chandel-Satter**'s analysis generally agrees with the classical view, but he reveals that one notable design client also has been successful in developing the V-gutter type. His conclusion, an overturn is applicable to either the channel or the V-gutter type.

Details of the chondyli type are shown in accompanying illustrations showing various supracarpal combinations. The various configurations lends itself to all the explore installers illustrated.

Shadowgraphs obtained at the reverse of that show that reverse effect

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STOPPING DISTANCES for jumbo and jet transports are illustrated for various run way conditions and loading applications.

Incidence is proportional to the deflection angle of the blast. Also, the blast clears the adjacent structure by a one inch margin.

Further work is proceeding to determine the effect of the second blast on other areas of the airplane. Deflection characteristics of the blast also are being checked, further says. These effects will be indicated graphically by

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● (2) Zeppelin Bomber, Youngest World War I



● (3) A new W. B. Army Bomber



● (4) Cutaway of a powerful jet engine

## WHO'S WHO in aviation progress...

CAN YOU IDENTIFY THEM?

The bombers in panels 1 and 2 were famous objects in World War I... but they are babies in the woods compared to the powerful B-52 (panel 3). You may recognize the old Gotha as the (1) Gotha Zeppelin "Glider" and (2) the Curtiss Triplane. These were truly giants of their day, but all their engines combined couldn't produce half the power that the J-54 Turbo-jet engine (panel 4) does. This Whanghous Electric power plant affirms Microcast blades... precision cast from special alloys which can withstand the tremendous heat of the modern jet engine.

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## FAILURE ANALYSIS ... CRUISE

### REVERSIBLE PROPELLER

Condition	Speed Factor
1. POWER FAULT - PROPS FEATHERED	1.0
2. POWER FAULT - PROP TO LOW PITCH STOP	3.2
3. POWER FAULT - PROP TO FLAT PITCH	15.0
4. PROP FAULT - POWER NORMAL - PROP TO REVERSE PITCH	5.3

### JET REVERSER

Condition	Speed Factor
1. POWER FAULT REVERSER RETRACTED	1.0
2. REVERSER EXTENDER BREAKS NORMAL	2.1
3. POWER OFF REVERSER EXTENDED	1.3

## FAILURE ANALYSIS ... TAKEOFF

### REVERSIBLE PROPELLER

Condition	Speed Factor
1. POWER FAULT PROPS FEATHERED	1.0
2. POWER FAULT - PROP TO LOW PITCH STOP	1.2
3. PROP FAULT - POWER NORMAL - PROP TO FLAT PITCH	2.5
4. POWER OFF - PROP TO FLAT PITCH	1.5
5. PROP FAULT - POWER NORMAL - PROP TO REVERSE PITCH	1.4
6. POWER OFF - PROP TO REVERSE PITCH	1.3

### JET REVERSER

Condition	Speed Factor
1. POWER FAULT REVERSER RETRACTED	1.0
2. REVERSER EXTENDER BREAKS NORMAL	1.55
3. POWER OFF REVERSER EXTENDED	1.05

CRUISE, TAKEOFF ANALYSES made by Boeing show results of failure conditions for reversible propellers, jet reversers. Severeest prop conditions would get's

much particular airplane design, he claims.  
► No 18 Effect-Engine characteristics during normal forward thrust operation are not affected by the climb or V-gear, reverser because no part of the device extends into the jet blast. Sutter reveals that scale model tests simulating the reverser have shown that engine operating characteristics are not affected.

Also, engine operating conditions are not changed, because the effective tail pipe area is unchanged at normal pressure ratios corresponding to full power. A reverser, plus bleed, could give a typical jet transport the ability to stop

on smooth air in about three-fifths of the required field length, thus would ease one of the most difficult of the design—that jet transport stopping capabilities under all conditions would be consistent with the dry-curve, back-slow stop.

Subsequent progress has been made. Sutter reveals, so that a fully detailed airplane calculation can be developed. Estimates indicate that a four engine installation would weigh about 1800 lb. a two-engine installation about 460 lb. With extensive development and operating experience, this might be quickly scaled to fit, Sutter says.

► Seventy Factor-In the evolution of

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the safety and reliability aspects of the jet reactor, it was felt that the device should be at least as reliable in the reversible position in its present state of development, better yet. A failure analysis was made in which the two retaining systems were compared. All conceivable types of failure were considered which could be attributed either to the reversible position or the jet reactor.

To provide a common basis of comparison, the results of the analysis were tabulated in terms of a "leakage factor." A leakage factor of unity means that for that particular combination of engine, flight condition and failure, the effect of the failure would be the same as if a single engine failure occurred.

A safety factor of two, better airplanes, would mean that the failure effect would be no worse in losing twice the thrust of one engine.

• **Tailrotor Assemblies**—Reversals occurring during takeoff and cruise were analyzed, with results as shown in the accompanying tabulations. The situation for takeoff is with the airplane over the "unstick" point.

Condition 2 gives for the propeller case is shown as a reference point, since it represents the most severe failure which could occur if reversing were not incorporated in the propeller system, better yet.

Condition 3 represents the first failure condition involving the reversing feature, and is the most critical condition. Not only is the effect on performance and control very severe, being of the order of magnitude comparable to a double engine failure at takeoff, but a very high propeller overspeed would result, better yet.

Condition 4 shows that cutting the power on the engine would alleviate the situation, but only slightly, since most of the drag is produced by the high induced lift of the blades in first pitch rotating at high rpm.

Condition 5 and 6 show that if the propeller passes through the flat blade condition, the reversed propeller condition is somewhat more tolerable. However, the condition is still 10% to 40% more critical than a single-engine failure where the propeller feathering, better yet.

For the jet reactor, condition 2 represents the most critical failure which can occur with this system. With the engine operating normally, the reverse command fully into the jet blast. The type of failure is (1) based on power in a single engine failure, according to the Boeing engine.

The effect of cutting power on the engine with reverse failure is shown in condition 3. Since the reverse thrust is directly a function of engine power, consequences of the failure can readily



$$F = C \frac{\rho}{2} S V^2$$

IN 1902, when the Wright Brothers were constructing the first successful powered airplane, there was data available on the forces on flat plates held at various angles in the wind. The problem of maintaining equilibrium presented the greatest difficulty of solution. The Wright Brothers had to depend on ingenuity, perseverance, courage and a home-made wind tunnel for solutions to their problem.

TODAY, IN 1954, aircraft development and production depend on the scientific skill of highly trained Engineers. During the past 50 years these Engineers have evolved countless formulas, such as the Form in-Force equation above, to help provide simple solutions to aerodynamic problems which once seemed insurmountable.

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be released by cutting the power.  
► **Engine Analyzed**—In the failure analysis shown for the cruise condition, condition 2 represents the most severe case for a gas-turbine engine not equipped with reverse thrust. This condition, better says, would result in a large reduction in cruising speed to reduce wind-tunnel drag and propeller over-speed.

Condition 3 represents the most severe failure with a reversible propeller. This would give a very high over-speed condition as well as a critical performance and control condition.

Condition 4 shows that after passing through flat pitch, the reversed propeller condition is still somewhat more critical than the low pitch drag condition.

With respect to cruise, the most severe jet engine failure is that where the reverse extends fully into the jet blast with power on the engine—condition 2. By reducing power the reverse failure can be reduced in severity to become only 30% more severe than a simple engine failure.

► **Basically Safe**—The analysis indicates that the jet engine which is basically safe method for providing reverse thrust at the proper time. At the same time, the consequences of uncontrolled reverse which might occur as a result of malfunction are minimized.

The fact that engine fluttering is a positive and effective method of failure reducing the consequences of failure appears to be one of the attractive features of the jet engine, better claims. He emphasizes that the failure is always kept at a very low incidence rate, judging by experience gained with reversible propellers during the last few years, but points out that there are failures that can happen if various system malfunctions occur.

With the reversible propeller, systems which must operate continuously during normal flight also are used to control the reverse thrust cycle. He notes, however, that malfunctions occur during the entire flight, better notes.

The jet governor and control, he says, are separate from the basic forward thrust system. For this reason, the system can be effectively designed, except when control is required. Expense to malfunctions, he says, can be reduced greatly.

## ARDC Dedicates New Aircraft Weapons Lab

Wright AFB, Ohio—Air Research and Development Command has dedicated its new Aircraft Weapons Engineering building, which will serve as headquarters and engineering laboratories for the AF Aircraft Center here.

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Lt. Gen. Frank M. Andrews, together with other officials and personally in attendance first began new testing completion will provide facilities for qualitative evaluation of new aircraft as mentioned (Aviation Week Aug. 17, P. 21B).

USAF officials—including Gen. Edson W. Kewling, commanding general of the Air Materiel Command, Maj. Gen. James McCormack, Jr., ARDC deputy commander, and commanding general of other major ARDC centers—viewed demonstrations of new weapons, many of them still highly classified, during the exercises.

Future weapons—"The future security of the nation may well depend upon weapons which will be evaluated here," Maj. Gen. F. W. Timberlake, commander of Eighth Air Force Group, and the officials transferred the Andrews looking to Brig. Gen. Edward P. Meehan, AFPC commander. Timberlake admitted that "in certain fields of research, progress has not kept pace with AF needs."

AFPC points the advanced a dozen units of newly completed automatic rocket engines that will be used to test gas and rocket for control, fire and non-burning systems. Another major, testing completion, is the rocket balloons that are where rockets will be fired from a rocket-propelled sled moving at high speeds along a launching track.

Data Reduction Problem—AFPC is using major instrumentation largely a photographic because previously available automatic tracking system lacked sufficient accuracy, making data reduction a time-consuming process. Approximately 12 Scans are required to produce needed data from a 30-second test run.

AFPC plans to evaluate the capability of the tracking radar developed for the Nike missile. If this, or other types of automatic trackers can be substituted for photo recording, automatic data reduction can be used to greatly speed the process.

## Researcher Spends 56 Hours in Cockpit

What's it like to spend 56 hours in a new cockpit?

Not too bad, says Charles Dempsey, civilian employee of Wright Air Development Center. After the 56 hr. test conducted as a phase of the Center's accelerated work, he left the pressurized cockpit and watched television before going to bed for the first time in three nights.

Dempsey volunteered for the test, which was aimed at finding out how long a man could sit in an aircraft cockpit and what improvements could be

made in the equipment to make him more comfortable and efficient.

• **Railroad Museum—Dempsey was an astronaut to transit his brain waves, heart action, condition of his supporting muscles and glucose time action to recording apparatus in an adjacent building.**

Other instrumentation was used to check his fatigue level and vision and reaction times.

One example: During the test he was required to observe a rotating clock with a reversed scale. When the clock reached a zero point, Dempsey pressed a button. His reaction time was recorded.

Another example: Eight times every hour, but at irregular intervals, follow-up action in an adjacent building pushed a button to flash a red light in the cockpit. Dempsey had to push a button to shut off the light, and that action time was noted.

Radio communication was monitored at all times between the ground engineer and four other scientists and operators of WADC. A noise level of 115 decibels was maintained in the cockpit to check the effect of that noise—responsible to that in a jet aircraft in flight-on fatigue.

• **Restaurant and Apartment—The place used for the test was set up just**

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side one of the buildings of the Army Medical Laboratory.

Donaghy wore the complete pilot's rig: Mark IV harness, Mark IV air mask, P-3 helmet, oxygen mask, gloves, long undershirt, rubber boots and wool socks. Outside temperatures were sub-freezing, and Donaghy had to control the heat in his cockpit.

In addition to the main pilot's seat, Donaghy had two electrodes attached to his head, one to his chest and one to his back. These were linked to an electroencephalograph and an electrocardiograph inside the laboratory.

During the test, Donaghy's diet was liquids only. He napped at times, but most of the period had to keep his hand on the throttle and watch for signals.

### Helicopter Congress

Round-up of helicopter technology studies will be the main topic of the forthcoming Third International Congress of Vertical Flight, to be held at San Ramon, Apr. 28-29.

### Airport Fog Dispersal

Round-up of the latest fog dispersal techniques will be the main topic of the forthcoming Third International Congress of Vertical Flight, to be held at San Ramon, Apr. 28-29.



### Inerts Fuel Tanks

Explosive tanks are the bane of the war in the air. The fact that the fuel tank of the Northrop F-89 Scorpion has been completely sealed by use of new materials filled with crushed dry ice held by man in the control and suspended in the fuel tank is a fine work. CO released by the dry ice is "sucked" in solution to carry any oxygen in the empty tank to the point where combustion within the tank cannot be supported, according to Northrop Aircraft, Inc., engineers who developed the device. The plant manufacturer has installed an exclusive house in the Standard Safety Equipment Co. of Chicago to manufacture and market this explosion-inerting device, named "Inerts."



BOEING B-47, 4-RT BONNE at Lockheed Aircraft Corp., Marietta, Georgia, serviced by G-E Frequency Changer package that supplies ground power for testing all electrical control and equipment for radio, radio, and instruments.

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GENERAL ELECTRIC



G-E Motor Driven Emergency, 500/1000-watt, 20-volt (d.c.) See Bulletin GEA-5195



Motor Driven G-1 Generator, 25-watt, 100/1000-watt, 20-volt (d.c.) See Bulletin GEA-5195

Many types G-E frequency manufactured by the General Electric Electric Corp., Stamford, Conn., equipped with the AC and DC generators, rectifier and control devices.



As a high  
and low temperature  
seal for toggle switches

# SILASTIC

## works

where other materials fail!

Unique among toggle switch seals is the Hassard developed by the Autotonic and Precision Manufacturing Company of Tonawanda, New York. In this unit the entire toggle is encased in a Silastic® boot that is molded to the forming nut.

Chemically bonded to a nickel-plated brass nut and serving both as a seal and locknut, the one-piece Hassard can be easily and rapidly fastened direct by hand. An integral rib at the base serves as a gasket when the Hassard is secured, sealing freely against any panel surface, regardless of finish.

The extraordinary flex life of this boot made of Silastic, the Dow Corning silicone rubber, is proved by the fact that test units withstood 50,000 cycles at -67 F as well as 50 times the performance specified in MIL-8-3422. They also withstood 100,000 cycles at room temperature, or 10 times the life specified for the switch itself.

To make a good product even better on liner construction is molded in the throat of the Silastic boot. Thorough testing has proved that this secondary

seal will exclude dirt and moisture even after the tip of the boot has been damaged or destroyed. Originally developed and specified for such military applications as weapon releases, reflexive fuses and bomb arming, Hassards are now being put to many industrial uses ranging from outcrops to butter churns.

In addition to the excellent low temperature flexibility demonstrated in this application, Silastic has many times the life of other rubbery materials at high temperatures. Flex life studies made in our laboratories show that Silastic will take a 180° bend over 3/16 inch mandrel after aging for more than 6,000 hours at 300 F compared with less than 100 hours aging for a heat-stable organic rubber.

It pays to consider Silastic but when you need gaskets, seals or industrial rubber parts or electric insulating materials that will retain their rubbery properties and give long and reliable service at temperatures far above and below the limits of any other kind of rubber.



**Dow Corning Corporation, Dept. B-14, Midland, Michigan**

Please send me: ☐ Silastic high temperature seal materials of Silastic from your office. ☐ All Silastic products. ☐ "Sil Seal and Switch Form," a 14 page booklet on the application of Dow Corning Silastics.

Name \_\_\_\_\_ Title \_\_\_\_\_  
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Send Coupon Today for data on the Properties, Performance and Application of Silastic.



**DOW CORNING CORPORATION**  
MIDLAND, MICHIGAN



MARTIN XB-7A jet reconnaissance bomber, on which Silastics in its Probe lens, control, film off on test flight.

## Martin Steps Up B-57 Deliveries to AF



TAIL ASSEMBLIES and control systems are checked on workbench at Martin's Baltimore, Md., factory.



NINE: XB-7A reconnaissance planes undergo final ground tests at Martin camp. First XB-7A went to 16th Tactical Reconnaissance Squadron at Hahn AFB, S. G.



MARTIN B-57A light bomber leaves Underhill and assembly lines at night. Bomber deliveries began last August.



**SWAGGER PUNCH**—Two squads of battle-hungry Marines—35 men with full battle equipment—charge out of the new Sikorsky helicopter's side doors one door in a demonstration of airborne assault techniques. The huge XH40S was designed especially to meet the Marine Corps' need for a big, fast, highly maneuverable helicopter.

## WORLD'S MOST POWERFUL HELICOPTER FLIES FOR THE MARINE CORPS



**PRACTICAL DESIGN**—Location of two R-2800 engines in high, outboard pods leaves the fuselage open and clear for passengers, vehicles or other cargo. Wide clam-shell doors and built-in ramp permit rapid loading and unloading. The helicopter converts in size to a twin-engine aircraft. A commercial model, the S-64, will be built later.



**BUILT FOR BATTLE**—Sikorsky Aircraft's rugged XH40S, the most powerful helicopter now flying, was designed to carry out modern vertical assault tactics. It has flown with over 6,000 pounds of payload, and at speeds well over 100 m.p.h., with landing gear retracted into engine pods. Free-bladed main rotor and the tail built fold mechanically for easy storage and handling aboard ship.



**SIKORSKY AIRCRAFT**

BRIDGEPORT, CONNECTICUT  
One of the Divisions of United Aircraft Corporation







# Stafoam Offers Astounding Variety of Properties and Applications

STAFOAM is the name applied to all foamed-in-place plastics manufactured by American Latex Products Corporation. It is truly a miracle material! Its applications are so varied, and the results obtained in extreme conditions are so gratifying that it will revolutionize many manufacturing methods and procedures. At present STAFOAM is produced in three major types: (1) Rigid Alkyd STAFOAMS, (2) Rigid Phenolic STAFOAMS, (3) Flexible Alkyd STAFOAMS.



The two liquid components are poured together.



and stirred thoroughly for 30 seconds.



Mixture is poured into test vessel.



and foam to this height after 30 minutes.



to this height after 3 minutes.



After 3 minutes, foaming has ceased and mixture has become rigid.

## Nothing can be simpler than to pour liquid into the cavity which is to be strengthened.

Filling cavities with Rigid Alkyd STAFOAM does away with hammering for setting and chipping a new and often troublesome lining where structural members round the core members. The pour and blow method for such fabrication are also eliminated, together with the blowpipes and engineering involved. Quickly installed sealants can now be poured into the cavity which is to be strengthened. STAFOAM sets into a strong, lightweight one that does the job all by itself.



Here Stafoam is being poured into one of a complex wing assembly.

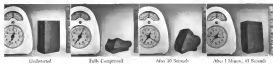


From left to right: (1) Open up for filling assembly. (2) Stop flow of foam, immediately before pour is poured. Note that no surface is left exposed. (3) Finished assembly. Strong, light, and more economically produced.

## Foam-in-place Stafoam simplifies manufacture

Ease of mixing the two components—the resin and the foaming agent—and speed of foaming action is shown in the above illustrations. The fact that STAFOAM can literally be poured into place, regardless of the configuration of the part or the size of the orifice, elim-

inates both the necessity for stress parts or prefabrication and assembly labor. Prefabricated sections in the case of the liquid components and a variation of the formula produce corresponding changes in physical properties.



## Rapid compressibility and slow return-cycle makes flexible alkyd Stafoam unique

Compression of Flexible Alkyd STAFOAM is similar to that of Rigid Alkyd STAFOAM but its properties vary in the final product. The gradual diffusion in the effect of the return force on these Flexible STAFOAMS can be compressed, elongated, or treated without damage. This unique property for their wide range of sand returns to original shape when drawing force are removed. It is an ideal product for absorption of stress of collision and impact, also for noise and vibration dampening. It is unaffected by low temperatures. Its uses are just being explored. Our engineers will welcome your suggestion.



Flexible STAFOAM is bent down to about half length. Except for this, it proves when against stress of pressure. It is ideal as a padding material.



Ease of compressibility of Flexible STAFOAM is shown here. Other STAFOAMS can be made tough and heavy.

## Shatter resistant



Crash testing through STAFOAM filled also on shattering, denting and lack of cracking was taken under by 50 other surface gas bodies.

Rigid Alkyd STAFOAM is highly shatter-resistant. Shatters is reflected with Rigid STAFOAM have considerable vibration resistance at a shock/impact and are generally considered in many industries.

## NOTE

Because of space limitations on these

illustrations it is necessary to complete STAFOAM is used in a variety of weather in dry, humid, cold, wet, and other conditions, including and thermal shock. For more general information on the Stafoam line, please write for our STAFOAM brochure.

## Electrical adaptability

Rigid Alkyd STAFOAM is highly adaptable for insulating, cushioning, and padding transformers, and other electronic devices, because of ability to be poured through any orifice. Dielectric constants and power factors also find themselves in electrical applications. In addition to STAFOAM's use as liquid foam, STAFOAM points can be poured and bonded in place for some applications.



Insulators for electrical systems installed with Rigid Alkyd STAFOAM.

## Range of densities

Cell size and uniformity of cell distribution can be closely controlled, varying from a nearly uniform mesh size to cells of 1/2 inch diameter. Formulation will also affect weight.

Excluded from other materials be specified with regard to structure and strength STAFOAM is readily adapted to specific requirements. Because of the variety of properties that can be obtained on Stafoam's use, range of densities is indicated in the two illustrations on the right.



Lowest density Stafoam is shown in this illustration. It is made in a range of cells.



The next sample is of the Stafoam made with the coarsest, largest, expanding cells. It is made in a range of densities.

STAFOAM, a registered trademark of American Latex Products Corp., is manufactured under "exclusive patent" awarded by Lockheed Aircraft Corp., Burbank, Calif. "Registered Trademark of Lockheed Aircraft Corporation."

*American Latex Products CORPORATION*

3341 West 81 Segunda Boulevard • Hawthorne, California

# No rivets No welds!

## New solvent-free EPON® adhesive allows immediate assembly of metal-to-metal bonded parts

Epox Adhesive VIII, which meets or exceeds the requirements of Specification MIL-A-8770 (C-5A7), provides dependable aluminum bonding with constant pressure alone—just enough to make a uniform glue line. Adhesive VIII contains no solvents; parts may be assembled as soon as the adhesive is applied.

Only moderate temperatures are needed for maximum bond strength. Adhesives, for example, bonds made at 120°F (1-1/2" wall) below the secondary cured bonding temperature for this resin.

Epox Adhesive VIII's excellent flow and low surface tension result in superior filler forming properties, substantially increasing the effective bond area in honeycomb applications.

Epox Adhesive VIII is equally effective in bonding rubber, plastics, glass and wood.

Epox adhesives are solving many difficult bonding problems. Can they solve yours? Write for further information and samples.



Adhesion through a bonding edge, forming honeycomb structure using conductive. Furthermore, such a structure may be assembled immediately after application of solvent-free Epox resin adhesives.



**SHELL CHEMICAL CORPORATION**  
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ELONGATED TUBES in close space used to support tube elements are the result of prolonged shock and vibration, cause tube misalignment and other faults.

returns (over a three-month period which Arco believes is representative) for the top 20 tube types is shown on page 37.

Arco breaks these figures down into three categories, necessarily arbitrary, according to the reason for the high rate of return:

- **Widepread usage:** 88N7, 6AG7, 6AGT, 6AGY, 6AY6, 6CA, and 6AGT.
- **High failure rate (in some or all applications):** 6AR6, 6AY6, 6H, 128K7, 6AG6, 6AU6, and 1C51.
- **Combination of both:** 6AK5, 6H, 12AT7, 6AS7, and 12AU7.

Arco notes that improved (optional) versions of 17 of the top 20 tube types either have been designed or are in process. Two of the 20, the 6AG7 and 128K7, have no approved counterparts because they are used principally in shatterproof equipment and are being replaced by newer types of tubes in new equipment.

None of the premium types appear in the top 20, Arco says. However, very few were in use up to the end of the period of the report (Apr. 1, 1955).

• **Deterioration Factors:** The Arco report lists several causes of tube failure: routine beam gradual deterioration of electrical characteristics. These are:

- **Loss of emission:** Arco says that rate of decay of cathode emission is directly related to the amount and quality of residual gas within the tube. During use, the cathode (and other tube elements) gradually absorb that gas, reduce emission. Noting that early tube-life deterioration due to gas poisoning has been observed in 6AR6 and 6AGY, Arco concludes that present tube manufacturing practices do not adequately take such equipment designers for account in use conservative power ratings and reduced temperatures in order to keep operating temperatures in all tube parts below the values required to release occluded gases.
- **Poisoning of emitters:** Tube types in

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which Anac found most frequent for sections of aircraft tubes on the cathode included 68N7, 12A17, 12A17, 6A8C, 6A8C, and 6C4. Anac is running a controlled test on 68N7 to evaluate the effect of various cathode materials and other factors on the rate of inner tube formation. The use of less active metal sleeves for the cathode is believed to reduce surface formation.

Anac estimates that if gas poisoning and surface formation could be eliminated, cathode sections would last until the cathode coating was completely evaporated, possibly for 100,000 hours.

► **Permeation of Materials.** Trapped metal ions and tube elements is deposited on colder surfaces, such as metal and glass insulators, resulting in gradual deterioration of their insulating properties. One solution is to coat metal and glass surfaces with rough insulating material to increase the length of the leakage path, Anac says. Other solutions include the use of shielding to prevent surface deposits, use of magnetic shield alloys with induced magnetic fields, use of non-evaporating "getter," and limiting operating temperatures of all tube elements. Several of these solutions also reduce surface formation.

► **Vibration.** Endorsement of the higher in mass spaces which support tube elements is apt to be a problem when tubes are subjected to vibration and frequent shock, Anac says. Shocked tubes allow tube elements to vibrate, producing spurious signal (microphonics) (see photo, p. 61). There is also evidence which indicates that the powdered metal resulting from vibration may poison gas which poisons the tube cathode, reducing its resistance. Anac reports that tube manufacturers are designing tube elements for greater rigidity, using closer tolerances on more space factors, and in some cases using new materials, such as "Evoxite" as ceramic, in place of steel.

► **Cathode Specific Problems.** The Anac report lists the following causes of cathode types of tube failures which occur without obvious warning:

► **Gas discharge.** Gas discharge or air over within a tube may be caused by overloading of an electrode and it releases additional gas to reach gas discharge potentials, by heavy heater-cathode leakage which can become self-sustaining if heater-cathode voltage is high and the temperature is high, or by slow air leaks in the leads due to improper seals of the heater wires at relevant tube tips.

► **Glass cracks.** If the glass envelope is not properly annealed during manufacturing, or if subjected to high convection or thermal stresses during installation, the glass envelope may crack. Anac concludes that most of both defects are caused by rough handling. Except for a few large tubes extensively mounted on





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aircraft equipment. Acme says it found no cases of glass cracks due to shock and vibration.

• **Shuts metal opens.** The tube electrode and subject to shorts and opens is the heater, Acme says. The heater, as the heater or other tube electrode, is precisely the result of high operating temperature, Acme says. For instance, the 5A5, whose heater temperature ranged up to 1500K for some tube assemblies, contributed the largest number of failures due to open heaters when the Acme program started. When the program started (1954) of the tube was designed as its heater operated at only 1075K, but burn-out defects particularly disappeared, Acme says.

"The importance of heater temperature during normal operation of aircraft equipment cannot be overemphasized," Acme says. The construction of heaters in impossible combination across the day's d.c. supply bus, usually regulated at 27.5 volts, applies 4.9 volts across tubes' 6.1 volt heaters. If the heater string is not perfectly balanced, even more overvoltage is applied, further raising heater temperature.

• **Success of Wadsworth.** A brief summary of other Acme findings on specific tube type weaknesses shows: • **6SN7GT.** Susceptible to surface corrosion. Suggested remedy do not show any significant improvement, Acme says.

• **3C51.** Tendency to develop microphonics due to wire mesh, leakage, or combination of both. Close spacing between electrodes, offering short lead, up tubes, has not been corrected in previous type 3C51, Acme says. • **6AC7.** Rapid corrosion, deterioration results from combination of high envelope temperature and high current density.

• **6C26.** Thin trade, electrical in half of a 12AU7, shows similar degradation, but more serious deterioration. No surface corrosion than a 12AU7. Acme offers the possible explanation: 12AU7 is generally used in circuits where plate current is reduced or cut off for long periods.

• **6J4.** Susceptible to surface deposits on glass surface of base, producing low resistance leakage between pins. Although fault occurs at moderate temperatures, it appears to be aggravated by tube's normally high plate voltage and high heater temperature. One to relieve this use be necessary, Acme says.

• **58X7.** This widely used rectifier gives indication that its filament is too weak to withstand sustained vibration such as encountered in aircraft, Acme says.

• **6AL5.** Very low screened rate and no apparent weakness.

• **6SK7, 12SK7.** Identical tubes, except for heater voltage, but the 12 volt type



## Instead of starting all over again

Here's how the Lukens Steel Company, Coatsville, Pa., uses Kodagraph Autopositive Paper to eliminate retacing in preparing flow diagrams and piping layouts.

Trace diagrams and layouts went also show the flow plans and fixed equipment installations of the departments involved. But instead of retacing this information from the basic plant layout drawings, Lukens Steel simply reproduces the drawings on Kodagraph Autopositive Paper—gets positive, photographic duplicate through directly. This gives the draftsman a three-dimensional head start for his only job to add the new detail to the Autopositive print—and another job is done instead of being barely begun.



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► **New NWA Alaskan Station**—Northwest Orient Airlines is installing a radio station at Cold Bay, Alaska, north end of the Alaskan Island chain, to see if it can provide adequate communications between there and Japan. Service is now provided by NWA's station at Sitka Bay, 125 miles west of Cold Bay at opposite end of Alaskan chain. Project results from possibility that USSR will abandon Sitka, forcing Northwest to do likewise.

► **5412 Shown** New Aerospace—Mississippi Heavyweight recently demonstrated its new lightweight E-10 autopilot to Wright Air Development Center engineers at Dayton.

► **New RTCA Report**—The Radio Technical Commission for Aeronautics has recently issued reports prepared by three of its special committees.

► **SC-68**, The Application of Single Subband Techniques to Aeronautical Communications, Paper 11-54/DO-53, price 80 cents.

► **SC-68**, Calibration Procedures for Signal Generators Used in the Testing of VOR and ILS Receivers, Paper 235-54/DO-52, price 65 cents.

► **SC-95**, Standardization of Adjustment of Airborne Glide Slope Receivers, Paper 12-54/DO-51 (supersedes 56-76/DO-17), price 15 cents.

Copies may be obtained from RTCA Secretariat, 1724 "B" St. N.W., Washington 25, D. C. Payment should be made by check or money order. Checks are not accepted.

► **Aeronautics Conference**—Eighty technical papers have been scheduled for delivery at the National Conference on Aeronautics Electronics, May 20-22, in Dayton. Aeronautics conference is jointly sponsored by BPA's Dayton section and Professional Group on Aeronautical and Non-aeronautical Electronics (PGANE).

► **Expanding Industry**—Recent increases of aircraft industry growth include:

► **Kitay Manufacturing Corp.**, maker of precision urethane, acrylic motion, and light instruments, has expanded factory area 15% by purchasing new 45,000-sq-ft plant at Concord, E. I., N. Y.

► **Vicom and Co., Ltd.**, British firm specializing in aircraft radio, radar and electrical equipment, will open a factory in Kingston, Ontario.

► **Servomechanisms, Inc.**, has recently received a seven-and-a-half dollar contract for a new type of range area tracking computer, all required systems of equipment used with computing gear, rights reserved to effective in June. —PAC

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## Narco Puts DME Set in Production

By George L. Christman

National Avionics Corp. has put its new Model UHF-1 distance measuring equipment into full production, reports James M. Riddle, president.

The Andover, Pa., company has completed its pilot run of 50 sets. Twenty have been awarded for Civil Aviation Administration and the Air Navigation Development Board, and 10 have been ordered by the manufacturers for test and demonstration purposes.

The UHF-1 has been three years in the making. "Gold Plated Model"—in developing the DME set, Narco took the concept from the one it followed in working out its civilian distance equipment (the company says it has built 10,000 sets) set—more than half of all civil means produced. In the area progress, every effort was made to cut cost, in the DME program, Narco resolved to make the best possible piece of equipment, regardless of cost, Riddle says.

One reason for this is that the set is aimed not only at the business and creative phase market, but at the core general market as well.

As a result of the "gold-plating" involved, the \$10/50 set incorporates: • Regulated tubes. These cost consid-

erably more than standard electronic tubes, but give a considerable increase in reliability.

• Permanently sealed relays. Through use of hermetically sealed relays throughout, the set gives complete protection against moisture, dust, dirt and corrosion, and its high-altitude operation is enhanced. The set can operate up to 40,000 ft., says Riddle.

• Crystal tuning. Narco felt that crystal tuning was a "must" to give the DME set very accurate long range operation at relatively low altitudes. Because an crystal tuning caused a year's engineering delay, Riddle says, while personnel wrestled with the problem of adapting the "locked-on" type of tuning to the equipment. Long a standard feature of airborne radio receivers, crystal tuning will now characterize complicated alignment procedures and simplify and reduce maintenance on the DME set, Riddle believes. Many field service problems will be eliminated.

The tuning control is a standard pre-mounted crystal tuner, with turn knob indicating the desired frequency. If such a frequency selector is already installed in the aircraft, the same switch may be used both for the VHF receiver and the DME, Narco says. The unit is a self-contained panel space.

Narco's DME came entirely on d.c.

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RYAN is harnessing the latent particles of matter—electrons—to guide high speed missiles and aircraft. Through electronics research, Ryan Engineers are developing guidance systems components for missiles and airborne navigation devices for piloted planes. By these electronic means, guidance data is gathered at thousands of times the speed which the human brain can accomplish.

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RYAN has a unique environment for this research. The same engineers who design electronic systems, use the planes and ground stations for testing them in actual flight and evaluate their test data in the laboratory. This results in complete continuity of development and thorough integration of each problem from laboratory to operational stage.

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power and controls easily to either 12-volt or 24-volt systems. The complex, compact weighs 30 lb, including shock mounts. The set uses dual transistors and vacuum tubes, optimized for maximum efficiency.

► **Simple To Operate**—That's how Newco's TIME operates.

As soon as proper frequency of the VOR/DME or RNA secondary station is selected, the needle on the indicator goes into search. It sweeps slowly from zero to full range, sweeps rapidly back to zero, and repeats the cycle until it locks onto the interrogator's ground station. This occurs when the ground station crosses approximately into line of sight.

As the plane approaches the station due to an "in route" mode, calibrated from 0 to 200 m/s, it may change to an "up grade" mode, reading from 0 to 20 m/s. If the plane crosses the ground station, the DME pointer will register the plane's altitude (i.e., distance) when it crosses over the intermediate.

► **Strong on Serviceability**—Nuro employs a standard 4-ATA rack and can be removed quickly and easily by unplug-  
ging the antenna leads and loosening  
the locks. Nuro and the DME can be  
completely disassembled in less than  
two minutes, providing access to all  
components.

The EEC basic elements—receiver, transmitter, range unit, power supply and automatic channel selector—can be unplugged from each other to allow for rapid test, inspection or replacement. This makes for quick addition of any



### Instrument Checks

This portable bench tester for jet aircraft electrical instruments checks conventional instruments such as Zero Reader, turn-screw indicators, gyro compass, etc., prior to their installation in aircraft. It is designed by USAF MRF, Walter Rando (above) with the Inland Air Defense Force's 51st Fighter-Bomber Squadron, Kefauver, and was built from scrap parts, even 5/8" and 1/2" aluminum to be one of the first portable units of this type.

## MB-designed suspension solves "difficult engine installation"

in Sikorsky twin-engine helicopter



► **Mounted at Angle**—The main rotor assembly utilizes five blades of about 45 ft. length manufactured by a process described in *Aviation Week* (Sept. 16, 1951, p. 11).

Image stabilization is one of the most difficult yet tested in a lens design. The R3000 double-view picture engine is mounted at an angle to the main fastlags with the crankshaft pointing toward the main motor assembly. Cooling is coming in through a duct in the leading edge of the stator.

Expelled from Religion West  
of January 15, 1934

New lightweight M8 mounts isolate the two P&W R2800 engines

■ With two engines, the Marine Corps' new Sikorsky HH-60 represents a major event in helicopter progress. But that twin power plant had also meant double trouble in testing. Called in on the problem, MB vibration specialists designed a successful suspension system for the angle-bracketed engine. Vibration was isolated—a smooth, comfortable ride instead.

MB cooperation yielded still another benefit. The HRES used the new lightweight aluminum MB engine mounts developed especially for MAW R100 engines. Their advantage: Each mount weighs 38% less than the unit it replaced.

Relationship in vibration engineering explains in part why many manufacturers rely on MB— for engine mounts and for help in application.



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trouble and speedy return of the jet to service.

Service Center—in an effort to provide nationwide coverage for its customers, Navco has established 19 service centers. They are manned by factory-trained DME specialists. Each center will be supplied with necessary test equipment, including a \$4,000 DME simulator, according to Rodde.

Navco aims its service philosophy at "Remove and replace," wherever possible. This way, the customer is disturbed a minimum time, and the service man can repair the defective component or ship it back to the factory.

## 'System' Tests Get Bugs Out Faster

Application of the "intense" concept... to the field of automotive equipment is being pushed by Parker Aircraft Co., Los Angeles.

Parker's idea is to test complete aircraft systems, with all accessories in place, under the equipment maker's roof, instead of in the aircraft manufacturer's plant. The company is now applying the concept to the fuel system for a Cessna's lightweight fighter and very results are good.

The conventional test rig set up at Parker's plant duplicates the plane's fuel system—ground and air—inlet, fueling, and fuel transfer systems, both

fuel to tank, and tank to engine. The rig, built by Grossman, incorporates all the Parker-enhanced components such as pumps, valves, etc.

The company believes that its new test rig will result in a better operating engine. Designers, engineers, inspectors and field service employees of the equipment maker can simulate at their leisure and study these problems in its final environment. Changes can then be made and malfunctions corrected as fast as they crop up.

The alternative to fix, as Parker sees it, is the usual method of scolding out new equipment, often without the system of which it is to be a component, to be shipped along by a field service representative.

## Machine Simplifies Exhaust Re-Boring

Bohrton industry is pleased for a machine that is born inherent parts and parts exhaust supplier at Eric American World Airways' engine overhaul shop at San Francisco International Airport. Because of its great accuracy in alignment of the exhaust system's components, the machine permits greater and easier engine build-up and helps lower possibility of engine fire, says FIA's Pacific/Alaska Division, which developed and built the device. With this tool a non-fitted air



## New Broom for Jet Runways

Grossman Aircraft Engineering Corp. will test a magnetic sweeper to clear runway and taxiway areas at its Reddick, N.Y., plant of small metal objects that might be sucked into jet engines and damage them. The new machine "broom" consists of a magnetized and reverse rotary brushes sweep up most of the debris on the run-

ways, and onto which has been grafted an Extra Super Suction, whose three per minute magnet picks up nails, bolts and other discarded ferrous materials. The Eric company address, Eric, Inc. produces its magnetic Super Suction in various widths and strengths. The sweeper also may be pushed by hand.

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The challenge to protect sensitive electronic circuits from chemical shock, surface contamination and extreme vibration has been successfully met by Bendix engineers in this new standard "AN" connector.

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simple means for all assembly and soldering operations. Therefore, proofing is accomplished without the use of printed components, providing completely serviceable assembly line connections.

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ENGINE EXHAUST PORT is produced on Ford-developed and built machine.

chance can do the job that previously required a skilled machinist operating a radial drill or boring mill. Accurate cylinder alignment was difficult to achieve with the older method, says PAA. Also, the new machine has a ballbar, mechanically mounted arm for mounting supplies in exhaust ports.

The tool's high degree of accuracy is obtained by a series of index position locks that line up the cylinder barrel and head during boring, PAA says. The cylinder, mounted on a stand, is locked into position by an expanding mandrel.

The index locks also assure that tap plug are installed at correct angle and depth.

The machine is being used currently on PAA's R4546 engine, and is being adapted to handle cylinders from R2000 and R20400 powerplants.

## OFF THE LINE

Lockheed Aircraft Service International's East Coast base at New York's Litchfield Airport reports 587,746 man-hours of work performed in 1955, a jump of 40% over the 1952 all-time record of 420,585 man-hours. Delivered in 965 planes were 104% over the previous year. Of those, 526 planes were commercial, 22 were military and 417 executive. LAISI performed over 1,500 man-hours of work on prototype carrying helicopters.

United Air Lines has completed engineering plans for a proposed joint air base located on downtown San Francisco on the site now occupied by the airport bus garage. Because of heavy traffic congestion, the city has given the airlines a deadline of July 1956 to stop landing and unloading airport buses on downtown streets. UAL's proposal would provide terminal facilities to either a purchase or lease basis to all scheduled airlines operating to the city.

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Not so long ago it took a lumbering piece of a machine to start Boeing B-37's. The starter weighed 12,000 pounds, yet for this application provided only a shabby 57 hp horse power.

Today, thanks to brilliant engineering and the very finest components, Boeing starts the tremendous Pratt & Whitney J-57 jet engine with a new "air supply unit" which, despite its trim 2600 pound weight, delivers a bone-kicking 350 hp horse power! P.A.C. is proud to have had a part in the development of this outstanding jet engine starter through engineering counsel and manufacturing of a major component.



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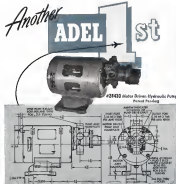
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See complete engineering specifications and actual aircraft ADEL DIVISION, GENERAL MOTORS CORPORATION, 3030 New Center Drive, Buena Park, California



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CANADIAN REPRESENTATIVE: AIRWAY & POWER ENGINEERING CORPORATION, TORONTO

brake. Other features listed are 24-in. inside width, 2-in. inside flange, 6-in. flange depth, 14-in. width between bearings, Torrington roller bearings and hardened steel and precision ground run guides.

Unit is available with complete line of standard and special dies. All dies are interchangeable with other standard press tooling.

O'Neil Irons Manufacturing Co.  
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### Small Electronic Timer Handles Cycling Jobs

Electronic timer, providing delayed shut-off or start, is being offered for wide variety of mechanical and electrical equipment by Bendometer Manufacturing Co.

Known as Tel-Trol, timer is claimed to be continuously reliable from 6 to 10 seconds, immediately recycling when triggered. It is of the accurate-type type and recycle time is added to balance of previous cycle if triggering occurs before shut-off is reached.

Unit handles a 10-amp. non-inductive load at 125 vdc. It operates on 115-v. single-phase, but company reports models are available for 220 or 440 v. 3-phase operation.

Timer consumes approximately 3-watts.

Bendometer Manufacturing Co.,  
1815 W. Rosemead Ave., Glendale, Calif.

### Glass-Plastic Template Easy to Work With

A plastic template instead of conventional glass one equipped with a blend of Plexiglas polyester resin, is said to have dimensional stability equal to or better than that of the metal it replaces, but with transparency greater than that of tracing paper.

Tracing can be made quickly by autocatalysis by non-technical grade personnel using the material in place of working from metal sheet with costly perspective cameras. It also is said to have easy storage—a 10-lb. sheet of the plastic can be rolled no thicker than a window shade, says the supplier.

Material is made in rolls to 60 in.



Summers' new PAR Gyro sets precise latitude/longitude reference points on its known trajectory. Accurate position and rate figures are obtained by a position gyro and a variable rate unit, respectively, then algebraically added by a third unit. Summers' emerging PAR Gyro provides precise position rate as a single product. Processing but one degree of freedom it avoids the complexity and limitations of multi-gyroed gyros. Unlimited movement may be called for by applying an appropriate command voltage directly to the Summers single-gyro PAR Gyro. Drive rates are in the order of 0.1 degree per minute.

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For emergency control, designed and manufactured for the French SH 16A, battery handle which is also warning light. Signal from aircraft fire detection system causes lamp to glow red. When pilot pulls this knob off he activates pressure switches contained forward of instrument plate which are fire alarm gauges system for trouble zone. Operating from 5 lb.—Aircraft Products Engineering Corp., Route 45, Dover, N. J.

Metallurgical seal, rated for brazing and service temperatures up to 1,800°, is particularly suitable for jet engine assemblies such as thermocouples and other components which encounter extremely high temperatures and severe thermal shock, says sales—Advanced Vacuum Products, Inc., 22 Liberty St., Stamford, Conn.

Synthetic rubber compound for O-rings seals in oxygen-type tanks under pressure conditions up to 1,500 psi. over temperature range of approximately half down to -321°. This rubber has low-temperature flexibility and rapidly recovers from distortion conditions to ease of positive compression in re-assembly fact, manufacturer reports—Goshen Rubber Co., Inc., Goshen, Ind.

Gas release valves reportedly measure volume of any gas passed through it, compensating principle of positive displacement. As gas is introduced into instrument, a set of reed valves. Valve movement is carried up through timing gears, a gear train, to collector disk which indicates cubic centimeters in large circle and liters in small circle. Accuracy is said to be within 5% between range of 5 to 65 liter flow rate per minute—J. J. Moogham Co., Inc., 500 Alcott St., Denver, Colo.

Mold release liquid for plastic products, known as Via Rock type R-2, is used for compression molding, laminating, casting and layup molding. It is particularly effective in and "semiconducting" mold surfaces, preventing sticking of extruded to mold. Liquid is packaged in 12-oz. aerosol type can for spray application. Manufacturer claims product will not damage any type of colored plastic—Via Rock, Inc., 6211 Almont Ave., Cleveland, Ohio.



## Preview of America's first jet transport

The model photographed above indicates how America's first jet transport will look in flight. The lower portion reveals the history-making airplane itself, now nearing completion in the Boeing Boeing plant near Seattle, Washington. It will be ready for ground tests by midsummer, and is scheduled to fly this fall.

Boeing is building this prototype jet transport to demonstrate the feasibility of its jet, range and speed one problem.

A military tanker transport, for instance, would complement America's such jet bombers and fighters, accom-

panying them on long range missions and refueling them while at their own choice of speed and altitude.

As a passenger carrier, the new Boeing will carry from 50 to 150 passengers, depending upon the seating arrangements chosen by the airlines. It is designed to fly non-stop from coast to coast or from London-New York, jet service efficiently over shorter routes as well.

The great new craft will travel the roughly 9000 mi. around 40,000 feet while maintaining a cabin pressure equal to 7,000 feet. It will be usually free of vibrations, and will cruise at the 550

m.p.h. range. It will be able to operate from existing airports.

Boeing is investing over \$15,000,000 of its own funds in the project. This cost is Boeing's contribution toward the creation of an airplane essential for the security and the transportation progress of the nation.

Although of entirely new design, the passenger jet is based on the thousands of hours of research and flying that Boeing has put into the design B-47 and earlier jet B-52 bombers. It is also the product of the world's most extensive background of experience with large, high jet aircraft.

**BOEING**





COMPLICATED ROUTE NETWORK shows intensity of airline competition in the Caribbean area, most of it developed since 1948

## Merger Proposal Stalemates Balboa Case

General feeling among airlines involved in the three-pronged Balboa through service case is that Gov. Antonio Boud's proposed merger of Balboa Airways and Panagra routes in South America has made final settlement impossible (Aviation Week Apr. 5, p. 18).

The Board's action has left the nation in a state of complete confusion.

How are latest developments?

► **Board, standing to benefit.** A public hearing last week a success, serving an opportunity to bring its long case before national opinion out of the "red."

Gov. Balboa, vice president for traffic and sales, says a merger with Panagra may be effected in the near future, holding that it would be in accordance with CAB's "recommendation." The release is pending concrete proposals for the Board.

► **Panagra.** On the other hand, issued the statement "It is clear that the CAB opinion does not specifically encourage a merger of the two companies." Panagra officials are careful to indicate the road "negotiation" against Board's use of "recommendation" when reference to the Board's action.

The Board says it proposes the merger

with a view to eliminating the weaknesses of existing duplication of routes. But Panagra claims for members CAB's own statement in support of such a merger.

► **Board's shareholders may** also have the opportunity of disengagement from what has not been a particularly successful undertaking from their standpoint, as well as to remove the power divide as to their ability to return the full amount of later profit earned on their domestic system.

► **Other proposals** on the case, involving proposals of one-time service between New York and Balboa, C. Z., state involved under the President's intervention. These proposals include equipment interchange agreements between Pan American World Airways, Panagra and Eastern Air Lines as well as between National Airlines and Balboa.

► **Strong Resistance.** From all sides there is strong resistance to the establishment of an independent airline such as the Board considers. CAB on the other hand, is coming up with the proposal and deferring decision for 60 days, has shown that it will not consider any of the previous inter-company change proposals. The result is a stalemate.

► **Losing Operation.** Some airline officials note the latest action as "The most indecisive move made by the Board in recent years," holding that CAB is trying to make up for having introduced Balboa's losing international operation in the first place.

Originally, Balboa's sole operation was domestic, in 1946, however, CAB extended the carrier's routes via Havana to the Panama Canal, down the west coast of South America as far as Peru and across the Andes to Brazil and Argentina. At the time, Balboa had notified it would require government assistance of only \$274,000 to bank, etc.

For the next five years the airline steadily lost money as the operation in 1951, in an effort to strengthen Balboa, the Board allowed extension of operations into Mexico on a temporary basis. The effect of this was to increase in Balboa's already expenditures from about \$2 million to an estimated \$10 million a year.

► **PAA Proposed.** The Balboa case was submitted in 1951, when Pan American proposed that PAA planes (including those of Panagra) operating out of Miami should fly to New York



FREWARP CARIBBEAN network shows stark contrast to today's overlapping routes

by the charter of Pan American aircraft over Eastern's route between Miami and New York. This would be at no cost to the government, passengers would not change planes and EAL would be credited for the Miami-New York segment of the flight.

This proposal was opposed by both Balboa and National. An adverse CAB decision was held for six months by President Truman until he was dead before leaving office, when he returned it to the Board with instructions to reinstate it to President Eisenhower.

Eisenhower returned it to CAB for further hearings and a new recommendation. Following hearings, as everyone urged the Board to reinstate the full approval of the interchange agreement (including through service to West Coast points). But CAB went up with the independent airline proposal instead.

The American holds that approval of the original interchange agreement would result in a saving of more than \$1.5 million a year, even if Balboa's status was left unchanged.

► **Passive Predominance.** The feeling is widespread among industry officials that the Board got the wrong end of the stick in this present predicament by certifying Balboa for South American service as an airline (see page 18). In the most opinion, however (Aviation Week Apr. 5, p. 18) indications are that the Board is turning the gift of PAA and Grace before the case is decided.

Reynolds says strong opinion in this case, too, doing "I present you with the prospect of relying upon the pending authority just as a basis for the Board's thinking in the present case."

It is one of the most cherished traditions of the American passenger that no American passenger should be forced to use a foreign carrier to reach his destination.

► **Predominance.** The Board's suggestion

► **As a result.** Pan American—which was making a \$2-million profit then—had to have an \$11-million subsidy from the frequent last year for its Latin American operations.

► **Panagra.** which had a 1951-1952 subsidy in 1946, had to be given a \$2 million per year subsidy in 1955.

► **Board.** which was to come in and regulate competition and generate new traffic, would \$15 million last year. Before integration of Latin American operations, it had needed only \$561,000.

► **Taking the combined subsidies** of the three airlines, the total is \$15 million higher than in 1945.

► **Reynolds** had opposed the 1946 decision to certificate Balboa for Latin American operations. He had based his case on the basis of its long-range (international) services (Aviation Week Apr. 5, p. 11) through interconnection plus demands for airfare levels.

► **Ray.** Colabaugh, former USAF and Philippine air force officer and former American Civil Aeronautics Administration vice president of the probe by changing PAA management "without" President Truman's approval into relieving the suspension by failure to submit an acceptable alternative.

► **PAA.** Conditions. The government's conditions for resuming its international operations, the Republic said, included:

- **Annual subsidy** of \$750,000.
- **Government-owned** lines of \$15 million from the Philippine Reconstruction Finance Corporation.
- **A \$5-million** World Bank loan for purchase of jet-powered air transports.
- **Authority** to set up a separate corporation, PAA, International, with \$10 U.S. million participation.

Colabaugh claimed there was no need for PAA to lose money last year as its overseas operations as to that

that Pan American and Grace might use the expense and boards of the Attorney General's set by disposition of control of Panagra is likely to be manifested in an indirect process to force change in the route pattern which the Board denies details, and which has nothing to do with the merits of the operation involved in the Attorney General's suit.

Reynolds points out that reliance on the indirect suit is particularly inappropriate in the case of the through flight agreement, since CAB approved the agreement "in not being adverse to or recommend to the public interest." Reynolds notes that at the time the Board was fully aware of the difference among the civil ownership of Panagra and had been conferring with the Department of Justice on the matter.

► **Impasse.** In appearance, the through flight agreement, CAB had stated that it considered the arrangement to be "an improvement over the present situation . . . and that such transaction does not result in creating a monopoly."

The consideration that the filing of the pending suit now has a profound significance for the through flight agreement seems inconsistent with CAB's previous statements, says Reyn.

## House to Probe PAA Route Shutdowns

(McGraw-Hill World News)

Manila, P. I.—The Philippine House of Representatives has ordered a full-scale investigation into allegations that Philippine Airlines (PAL) forced the closure of its long-range (international) services (Aviation Week Apr. 5, p. 11) through interconnection plus demands for airfare levels.

► **Ray.** Colabaugh, former USAF and Philippine air force officer and former American Civil Aeronautics Administration vice president of the probe by changing PAA management "without" President Truman's approval into relieving the suspension by failure to submit an acceptable alternative.

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Colabaugh claimed there was no need for PAA to lose money last year as its overseas operations as to that

down the international services, thereby sweetening the nation's most efficient medium of transporting thousands the world.

► **High-Paid U.S. Executives**—The airline's management was reorganizing, he said, kept a worldwide network of on-person offices and employed U.S. pilots and high-paid American executives in positions that could have been filled by Filipinos at much lower salaries than those paid the Americans.

The representative also revealed a letterhead-matched offer by Transocean Air Lines to manage the Philippine international services for two years at a much lower salary than the one asked by PAL. This offer was not considered, he said.

► **New Inquiries**—Meanwhile, suspension of all service routes but those to Hong Kong, Bangkok and Taipei has given new impetus to the projected negotiation of a new air agreement between the governments of Britain and the Philippines.

Disagreements that last year led to cessation of the pact by Britain now are expected to smooth out amicably, because the Philippines no longer need protect PAL from international competition with British Overseas Airways Corp.

► **PAL's Spokes**—Also interested in the spoils of PAL's international shutdown are Queen's European Airways and KLM Royal Dutch Airlines.

But the Philippine Foreign Office is not committing itself hastily. It is trying to find a formula that will do justice to the various foreign airlines while, at the same time, removing the greatest benefit to PAL's limited regional services.

## TWA, EAL Forecast Coach Gains

Eastern and Trans World Airlines' officials say increased profits in 1954 because of integrated gains in coach travel after the past year of declining incomes.

TWA's president Ralph S. Daines says: "The increasing holiday travel (after past vacations and the dearth of Americans to travel) at home and abroad leads us to believe that 1954 will show an increase in airline revenues. TWA at a leader in the so far least market should be able to capitalize on this opportunity."

Eastern's head chairman, Eddie Rickenbacker, reports: "Although revenue from aircraft operations is substantially less per passenger mile than that produced by regular line traffic, it is confidently expected that... before long, new traffic volume developed through aircraft service will account for 40% of our total passenger miles."

All two-engine equipment in our fleet replacement program was designed for ready conversion to the type of service where needed."

► **Speculated Operation**—Rickenbacker adds in a company's annual report, that the airlines market has been the principal source of EAL's revenue.

However, he says, with the greatly increased seating capacity that many of Eastern's present and most of its future transport aircraft will provide, "it is doubtful that the airlines market can expand proportionately."

Freighter operations will become "more and more specialized for high-priority business and general travel" he predicts.

► **Income Drops**—TWA's net income for 1953 was \$5,064,592, or \$1.52 per share of outstanding stock, compared with \$7,660,158, or \$2.50 per share in 1952 (Airlines Week Apr. 5, p. 7).

EAL had net profit of \$7,021,567 or \$1.23 per share, compared with \$8,511,451, or \$3.41 per share in 1952 (Airlines Week Apr. 12, p. 7).

Failure of net income to keep pace with the growth of TWA's revenues, says Daines, resulted primarily from two factors:

► **Income** of \$5,454,731 in depreciation charges resulting from additions to the airline's fleet.

► **Combination** of temporary mail rates applying to the International Division. Rickenbacker blames his loss in profits from leased economic readjustment in general because that began the latter part of August. The last quarter of 1953 reflected a steadily recovering margin between expenses and revenues.

► **Rate Policy Confirmed**—Daines reiterates his claim of last year that the temporary mail rate in the International Division "was designed by the Civil Aeronautics Board to yield no return on TWA's investment in that division." The International Division in 1953 received a net loss of \$145,599 before provision for income tax be paid out, whereas the Domestic Division, on a considerably small per hour, earned a profit before income tax of \$18,851,875.

The TWA chief executive calls the temporary rate policy "unfair, especially in view of the fact that no permanent rate has been established during the



## IN PRODUCTION

The acceptance by the U. S. Air Force of the Beechcraft T-34A as its standard primary basic trainer is a renewed expression of confidence in the ability of Beech Aircraft to build airplanes to existing military requirements and in the integrity of Beechcraft to support its airplanes with continued engineering, service, and spare parts. Beech Aircraft is proud of its long tradition of building military trainers in World War II ninety per cent of all U. S. bombardiers were trained on Beechcraft. Thousands of Allied and

U. S. pilots and navigators have received and are still receiving their wings after instruction on Beech-built airplanes.

The Beechcraft T-34A (Mentor) trainer is the product of twenty-one years of accumulated knowledge and experience of Beech engineering, suggested by the latest production techniques and factory equipment. Developed by Beech Aircraft as a private venture, the airplane has been ordered into quantity production as the USAF T-34A trainer.



### Vickers Develops Jet Transport From Valiant Bomber

Scale models of the new Vickers 1000 jet transport (left), now under construction for RAF, and the Vickers Valiant, jet bomber, from which the 1000 is derived.

show certain similarities—particularly in wing planform and engine mounting. Comparative views also are shown by the models. The Vickers 1000 is to be powered by four Rolls-

Royce Conway jet engines and will have seats for 100 passengers. The manufacturer says a substantial revision of the 1000 could open the Atlantic route.



The Beechcraft T-34A trainer is now in production for the U. S. A. F. and the military services of twenty foreign governments.

Beech Aircraft Corporation, Wichita, Kansas, U. S. A.

Product Lines: USAF T-34A • USAF T-33B • USAF C-47 • USN B-1 • Model 20 Bonanza • Model 30 Turbo Bonanza • Model 35 Bonanza • Model 36 Bonanza

enter eight years of TWA's international operations."

• **Revenue losses**—Eastern's passenger revenue reached a new high of \$136,402,574 in 1953, 21% above 1952. Network revenue accounted for \$51,480,022 at 23% of the total passenger revenue, 26% higher than 1952. Airports increased to \$1,776,966, 10% higher than 1952. Air cargo totaled \$1,780,160, accounting 3% of total revenue, an increase from \$2,529,872 in 1952 to \$3,668,287 during 1953, a gain of 46%.

TWA's passenger revenue was up from \$135,507,496 in 1952 to 1959, 87% higher last year. Freight and express increased from \$9,594,081 to \$10,631,236. Transportation and revenue was \$5,741,654, compared with \$4,604,816 in 1952. International mail was \$3,823,239, compared with \$3,563,178. Mail pay from foreign governments decreased from \$3,799,165 in 1952 to \$2,784,574 in 1953.

## ATA Claims Mail Test Saves 3.5 Billion Hr.

Post Office Department's experiment is flying a portion of first-class service mail between major cities has saved 3.5 billion hours of delivery time, Air Transport Association claims.

Earl D. Johnson, ATA president, says "this test mail has not only been expedited

more than five times as fast as when ground transportation was used, but also over ten of mail flows on these tests the Post Office has received from the public, \$2,110 a ton for transporting and handling this mail."

After paying the airlines for flying this mail, Post Office has been able to return more than \$2,680 of that sum, ATA says.

The association has developed the following statistics on the New York-Chicago and New York-Miami, Jacksonville-Tampa-Chicago segment:

"Between New York and Chicago, an average of 724 airmail, at 13.6 cents a ton-mile, scheduled airmail cost \$114.66 per ton for handling the first-class service mail. Then, the airlines received only 4.9% of postal revenue for flying the New York-Chicago airmail, while the remaining 94.1%, or \$2-175.34 is available to the Post Office. "Of the total sum of \$10,125,780 the Post Office has received on all airmail, it has an excess of \$9,554,656, or 92.5% compared to the current."

## CAB ORDERS

(Mar. 31-Apr. 5)

### ORDERED

Proctor Air Lines to show cause why CAB should not set rate into for the cause: Northwest Airlines to show cause why it be

Board should not set temporary route over trans-Pacific route.

The American World Airways to show cause why its CAB should set its temporary rate on trans-Pacific route.

Intercontinental was advised lines asked by Pacific Northern Airlines, Alaska Airlines, Canadian Airlines, Northern Consolidated Airlines, United Air Lines, West Coast Airlines and Western Air Lines.

Seamless Airway Co. to show cause why CAB should not set its mail rates.

Revenueless was Pan American's proposed rate of 18 cents per pound of fuel mail, space and baggage have between San Francisco, P. R., and New York.

### ISSUED

Proctor Air Lines to appear in before the Interstate Commerce Commission to discuss its transportation of passengers.

### GRANTED

Intercontinental was approved for its application of North Coast Airlines to serve International Falls, Minn. as a proposed line.

Canadian Airlines' proposed, rejection in order to serve Philadelphia-Canada, N. J., on its Frontier, N. Y. Washington, D. C. route, provided it does not transport local traffic from Philadelphia to Canada and Washington.

### APPROVED

Intercontinental was approved between Capital Airlines and Delta Airlines Air Lines and various other carriers.

South Atlantic passenger lines and cargo rates agreed to between Pan American and various other carriers.

Interlocking relationships of Fred R. Allen, A. J. Bingham, Capital Air Transport and Viking Air Transport Co.

### REVOKED

Intercontinental was rejected that a report dated Dec. 12, 1953, with the cause of the rejection is permanently withheld from public disclosure.

Inter-GAS Air Lines' petition for its consideration of CAB's failure under delay in the carrier's application for temporary exemption to serve Ft. Wayne, Ind.

Alaska Airlines' petition to reconsider its proposed reduced Alaska rates.

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## SHORTLINES

• **Alaska Airlines** showed a 22% increase in tonnage revenue during 1953, with a general gain in revenue at 23%. Overall performance factor showed nearly 16%.

• **New York Airways** carried 354 passengers in its helicopter during March, compared with 219 for February, 287-420 lb. of mail were flown, against 214-420 lb., airfreight totaled 17,800 lb., compared with 22,000 lb.

• **Northwest Orient Airlines**, after a lapse of almost four years, is resuming service to Seoul, Korea. There, the weekly flights to Seoul will be diverted to Seoul, providing each city with two weekly flights.

• **Pacific Northern Airlines** added for additional morning flights between Seattle and Anchorage Apr. 15, raising the total to 19 per week.

• **The American World Airways** will fly between the U.S. to Europe until May 16 on a special 41-day tour of World War II overseas headquarters in France and Italy. The trip is arranged by Transatlantic Tours, New York.

• **Panama Air Lines** has started its fifth consecutive sales program, raising for a 10% load factor on all flights in 1954, an average of 10.5 passengers per plane-mile and a total of 34,553,000 revenue passenger-miles.

• **Delta Charlotte Airlines** has started (through an \$80,000 Canadian government subsidy and secured service to Montreal, site of the Alcan development, about 160 mi. north of Vancouver).

• **Subaru Helicopters** has dropped up daily helicopter passenger flight frequencies in Europe, increasing 5-15 times to two between Brussels and Lille, France, and to three on its Montreal-Airport-Brussels route.

• **Trans-Texas Airways** carried a total of 10,450 passengers in March, a 55% increase over the same month last year and an 8% increase over February 1954.

• **Wisconsin airports** have asked Civil Aeronautics Board to authorize airlines to enter into contracts with field airports for fuel, oil, water, maintenance and other services now handled by airport personnel. The operation, sponsored by Wisconsin Aviation Trails Area, say the agreements were among the threat of loss of local service because of high cost to the airlines.

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## IATA Studies Jet Fuel Specs

International Air Transport Association's technical committee has set up a special working group to determine uniform specifications for jet and turbo-prop fuels to be used by the world's scheduled airlines. The group is headed by J. T. Dwyer, Trans-Canada Air Lines' engineering director. Left to right: J. T. Dwyer, Pan American World Airways' chief chemist, G. C. Maguire, British European Airlines' chief project and development engineer, F. N.

Robinson of IATA, Dwyer, PAA was president, technical committee. A. A. Finner, P. L. Morrison, TWA materials and passenger equipment, and IATA's technical committee secretary Stanley Kapurabach. Other members of the jet fuel committee not present include: A. C. Campbell, Qantas; British Overseas Airways Corp.'s operations and development director, and Air France technical director Bernard Dwyer. Group is gathered at IATA's Montreal headquarters.

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## EDITORIAL

## Supplemental Services Promote Aviation

Urgent economic development and stimulation of the airport is vital in this era, when speed means so much to commerce and military affairs.

The government's Air Coordinating Committee will have an opportunity shortly in its forthcoming statement of air policy to clear away some of the confusion and announce a firm stand for maximum use and encouragement of the country's singular openness without impeding the financial foundations of any other segments of the commercial airline industry.

The big articulated carriers have moved most of their fleet to the low-fare passenger services; a few of the regular carriers have been conducting parallel to the scheduled services' transcontinental and subcontinent runs.

Actually, there are two independent sites engaged in this multi-type, ticket-selling service between major cities. The low toll operating claim they generate now traffic and compete very little with scheduled lines. This may be true, but surveys made by American Wines in New York and Washington seem to indicate that the congested centers have taken up most of the slack in the public demand for low-price transcontinental service, between four cities—New York and Washington to Los Angeles and San Francisco—and there is no question that they are offering fast, frequent and ethnic-oriented service to the public for the money—thats usually to the detriment to revealing the general use of the market for the first time. There still is much to be done to develop the public facilities, however, as both scheduled and unscheduled lines themselves probably realize.

Opposition to allowing any degree of irregularity by the independent centers in parallel services is deeply rooted, and perhaps the maximum need for such operations is past, although the independents point out that only about 10 out of 550 scheduled-airline cities are served by unscheduled coach, and some of these flights are at night and odd hours.

It is certainly unwise and wasteful to refuse to permit the independent carriers any legal place in the domestic commercial air transport picture.

Senator Pat McCarran, co-author of the Civil Aeronautics Act, is pointing out that the independents (non-scheduled or irregular operators) are not covered by the act, only a temporary

"We seldom write a definition of an *irregular carrier* (Civil Aeronautics Board) have made it difficult for a conscientious operator, who honestly seeks to run an *irregular* service, to know whether he is operating within the law or not. In the same way, they have opened up an avenue for evasion of the law, of which great advantage has been taken."

Yet the Civil Aeronautics Act is dedicated to the principle of promoting and developing all aviation—not a part of it—for the postal service, commerce, and national defense.

Despite all the attention that has been directed at the so-called parallel common carrier passenger services,

the independent companies draw part—in most cases all—of their livelihood from plane-load charter work that does not compete with scheduled, certificated airlines. It seldom is made clear to the public that the scheduled, certificated airlines are limited by Civil Aeronautics Board on-offline charter ceilings to 2-4% per quarter of the revenue scheduled miles in the previous 12 months, or about 10% of the scheduled revenue miles. This means that a great potential is left for independent airlines.

Since World War II, the charter potential has been indicated by independent traffic in passengers as well as a variety of cargo. Passenger rates give wings to athletic teams and fans, convention groups, executives, religious groups, and a widening range of other uses.

At present, the main work of the independent bus is in transporting troops, for which they have CAM exemptions to pass their vehicles through uncontrolled areas and to place beds and dispatch assets through control boards. If this system could be tied in legally with civilian charter, it should be possible to fill some of the military return beds that now fly empty, and to allocate much added traffic that supplements the scheduled civilian but does not compete with them. The largest possible transport should first and foremost be supported independently, without government subsidy, would be a selfless asset in emergency.

Since the major reason for economic integration is to provide wider competition that might weaken the national airline system, opponents of these independent point out, there should be no artificial barriers against letting free enterprise develop new traffic that is not competitive at all, and was permanent assuming authority as a reward. How else is aviation to be persuaded to enter its own economic marketplace?

The air exchange idea, for pooling of sales effort and equipment of small airlines for combined operations, already has been approved by the Senate Small Business Committee.

CAB has agreed to consider a proposal of Aircraft Transport Association for such an air exchange, to a decision can be expedited rather than wait behind 200 other agreements in the Board's files. This is commendable, and it is to be hoped that the Board will act favorably, as well as expeditiously.

Most important, the Air Coordinating Committee, representing the studied opinions of all government agencies associated with aviation, is a positive force for growth and activity for future commercial and military use of the independent operators, without thereby and without harmful competition to others in aviation. The ACC has one job: to increase the security that has kept the independent companies for so long. It also can associate the sound principle that in the yet undeveloped fields of aviation there is a place for all capital and pioneering in the American tradition.

Robert H. Wood

—Robert H. Wood

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A photograph of a control panel featuring three analog meters on the left and a digital display on the right. The panel is dark-colored, and the meters have white faces with black markings. The digital display shows some numbers, but they are not clearly legible.

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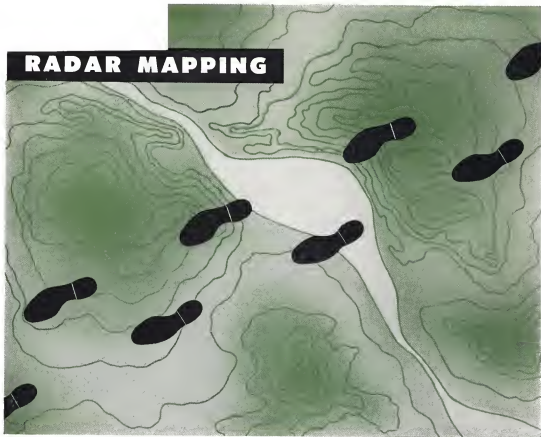
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